Weston—Waterville,
Havre—Waterville
AND
Waterville—Canso Cables
Repair Expeditions
FOR THE
Commercial Cable Coy.

1901—1903.

C.S.S. "BUCCANEER."

Presented by
The India Rubber, Gutta Percha, and Telegraph Works Company, Limited.

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GENERAL INDEX.

Weston—Waterville 1885 Cable Repair Expedition, 1901.

S.S. "BUCCANEER."

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952884

REPAIR

TO THE

COMMERCIAL CABLE COMPANY'S

Weston—Waterville 1885 Cable.

S.S. "BUCCANEER."

1901.

GENERAL REPORT.

GENERAL REPORT.

Silvertown, London, E.
July 10th, 1901.

R. K. Gray, Esq.,
Engineer-in-Chief,
106 Cannon Street, E.C.

Dear Sir,

Herewith I beg to hand you Abstract of Engineer's General Diary for the repair to the Commercial Cable Company's 1885 Waterville—Weston cable, off Dursey Head, about twenty miles from Waterville, in some sixty fathoms depth.

In reference to this work, the details of which are set forth in the Electrical Report handed to me by Mr. E. Raymond-Barker, and in the Abstract afore-mentioned, I have to say that the "Buccaneer" was, after the receipt of instructions from you on Friday forenoon, June 7th last, prepared for sea, and was ready to sail on the 10th. The cable from Messrs. Siemens' Works necessary for the repair being placed alongside the ship at 5 p.m. on that date, too late to permit of the ship going down river by the evening tide.

At 9 a.m. following day (Tuesday) the "Buccaneer" left her moorings off the Works, arriving at Gravesend in due course, and anchoring there to await arrival of Mr. John Gott and myself.

The passage down channel and across to the Irish coast was attended with strong westerly winds, and, on arriving at the vicinity of the fault off Dursey Head on Friday forenoon, a mark buoy was placed in convenient position near to splice between types 8554 and 8555 Siemens' (12/4½ and 12/2), but the weather being unfavourable for grappling, and showing no signs of improvement, the "Buccaneer" was set on for Berehaven to anchor for the night, leaving there on following morning (Saturday, 15th) for the grappling ground, on which day success attended the efforts

made, by the cable being grappled quite near the spot where the mischief had been done, and on the Waterville side of the fault. All details, electrical and otherwise, from henceforth being contained in the Reports accompanying, it is unnecessary to recapitulate here except by a few remarks.

The portion of cable mentioned as being badly damaged at seven fathoms from the Weston side of the cut, had six wires broken, and to all appearance had been recently injured by trawling irons; the wires were quite fresh at the fractures and the tanned jute inner serving exposed, but well covering the core. The sheathing at this particular part appeared to have been kinked, and afterwards straightened out under considerable strain, which had nearly resulted in rupturing the cable completely.

Regarding the two splices that came in during picking up; the first one, on the Weston side of cut and nearest Waterville, was a factory taper splice between the types 8555 and 8554 (H.I. and L.I.). The second one was a ship-made splice (L.I. and L.I.) between tanks, and the kinks and festoons of cable that came in were evidently caused by slack cable paid out while the laying ship had been slowed and stopped for change of tanks.

As to the fault, it was found to be in the second splice at a little distance from the joint, the core being discoloured a yellow greenish hue and covered with mud, with a slight grooved mark on the outside, there being ample evidence on subsequent inspection and testing, of the Teredo having been the cause of the fault.

The decrease in length of section after repair shows that about 50 per cent. of slack had been given out during this operation over a distance of less than half-a-mile overground.

The repair was completed by 6.30 A.M. on Sunday, June 16th, fifth day out, third day at work.

I am, Dear Sir,

Yours faithfully,

(Sgd.) H. BENEST.

REPAIR

TO THE

COMMERCIAL CABLE COMPANY'S

WESTON—WATERVILLE 1885 CABLE.

S.S. "BUCCANEER."

1901.

NOTES PREVIOUS TO LEAVING THE THAMES.

NOTES PREVIOUS TO LEAVING THE THAMES.

1901.	
June 7th.	S.S. "Buccaneer" commissioned to effect repair to the Commercial Cable Company's 1885, Weston—Waterville Cable.
June 10th.	Coiled on board "Buccaneer" 5·0 N.M. of cable from Messrs. Siemens' Works.
	Type 8553. 2 cores 90/85. Sheathed 15 No. 9 wires each ·143" dia. Weight per N.M. = 66 cwt. in air.
June 11th.	Left Silvertown for position of fault off Dursey Head, Ireland.

S.S. "BUCCANEER."

LIST OF STAFF, OFFICERS, CABLE-HANDS AND CREW.

LIST OF STAFF AND CABLE HANDS.

1. Mr. H. Benest, Engineer-in-Charge.
2. ,, P. Bates, Assistant ,, ,,
3. ,, E. Raymond-Barker, Electrician.
4. ,, C. R. Wylie, Hydrographer.
5. ,, E. Rymer-Jones, Accountant.

CABLE HANDS.

1. D. Smith, General Foreman.
2. W. Tillyer, Assistant Foreman.
3. C. Cakebread, Leading Hand.
4. B. Butcher, Leading Hand.
5. J. Brissenden, Lamps and Stores.
6. H. Livingstone, Fitter.
7. R. Schwartz, Cable hand.
8. C. J. Cakebread, jun. ,,
9. R. Duncan ,,
10. W. Mack ,,
11. A. Smith ,,
12. G. Middlemiss ,,
13. R. Malt, Jointer.

LIST OF OFFICERS AND CREW.

1. Mr. T. W. Sharp, Commander.
2. ,, A. Troan, Chief Officer.
3. ,, J. S. Roberts, Second Officer.
4. ,, F. L. Cooper, Third Officer.
5. R. Murray, Carpenter.
6. W. H. Stevens, Boatswain.
7. J. McDermott, Boatswain's Mate.
11. 4 Quartermasters.
17. 6 A.B.'s.
18. Mr. A. White, Chief Engineer.
19. ,, T. Budgett, Second Engineer.
20. ,, W. Macfarlane, Third Engineer.
21. ,, J. W. Cadman, Fourth Engineer.
22. J. Maguire, Donkeyman.
28. 6 Firemen.
32. 4 Trimmers.
33. 1 Engineer's Steward.
34. Mr. A. Patrick, Chief Steward.
35. R. J. Jardine, Second Steward and Storekeeper.
37. 2 Assistant Stewards.
38. T. Greaves, Chief Cook and Baker.
39. H. Groves, Second Cook and Butcher.
40. J. J. Cavanagh, Pantryman.
41. 1 Scullion.

SUMMARY OF PERSONS ON BOARD.

Officers and Crew	41
Staff	5
Cable hands	13
Visitor (Mr. J. Gott, of the Commercial Cable Co.)	1
TOTAL PERSONS ALL TOLD ...	60

S.S. "BUCCANEER."

SYNOPSIS OF VOYAGE.

SYNOPSIS OF VOYAGE.

1901.	
June 11th.	Left Silvertown for position of fault off Dursey Head, south-west coast of Ireland.
June 14th.	Arrived on cable ground.
June 16th.	Completed repair to the Commercial Cable Company's No. 1 1885 Weston—Waterville Cable.
June 17th.	Arrived at Weston-super-Mare to relay the Weston Shore-End of the Commercial Cable Company's No. 2 1901 Weston—Waterville Cable recently laid by the S.S. "Silvertown."

S.S. "BUCCANEER."

LOADING OF SHIP ON LEAVING THE THAMES.

DISTRIBUTION OF WEIGHT IN SHIP ON LEAVING GRAVESEND.

	TONS.
Cable in fore tank	Nil
Ballast ,, ,, ...	25·00
Cable in after tank, 5 N.M.	16·50
Ballast ,, ,, ...	55·00
Coal in bunkers	190·00
Fresh water in after fresh water tank	13·00
,, ,, ,, fore cone	7·00
,, ,, ,, side tanks	5·00
Water in ballast tanks (amidships)	70·00
,, ,, ,, (aft.)	15·00
Boatswain's stores (forward)	3·50
Carpenter's ,, ...	·75
Cable stores and buoys	28·00
Engine-room stores	4·00
Water in main boilers...	30·00
Steward's stores	6·00
Extra chain cable	1·00
Spare anchors, ropes, etc.	2·00
,, propeller	3·00
Deck machinery	10·00
TOTAL =	484·75 tons

Draught { For. 11′ 9″ / Aft. 13′ 6″. Mean 12′ 7½″

ENGINEER'S GENERAL DIARY.

S.S. "BUCCANEER."

STEAMING TO POSITION OF FAULT OFF WATERVILLE.

S.S "BUCCANEER."

HOUR.	FRIDAY, JUNE 14th (4th DAY OUT).
A.M.	
9.0	Arrived on cableground, off Dursey Head, 20·0 N.M. from Waterville.
9.15	Stopped ship and sounded in 38 fms. with Thomson's tube.
9.23	Sounded with Thomson's tube in 55 fms., f. gy. s. Commenced paying out moorings for a mark-buoy.
9.50	Let go mark-buoy, No. 40 B Flag. Position { Lat. 51° 33′·0 N. Lon. 10 25′·3 W. MOORINGS, 4 cwt. mushroom, 40 fms. $\frac{5}{8}$″ chain, 50 fms. 4×4 rope, 30 fms. $\frac{3}{4}$″ chain under buoy, $\frac{5}{8}$″ bridle, 12 fms. 4×4 side rope. Weather being unfavourable for cable work, standing on and off mark-buoy to await finer weather.
NOON.	Fine and clear. Strong NW wind with moderate sea. Bar. 29·99. Ther. 65°. D.B. 56°. W.B. 53°. S.S. 54°.
P.M.	
3.7	Calf Rock bearing North (t) dist. 1·0 N.M. Ran distance to buoy = 6·8 miles.
	GRAPPLING, ETC.
4.0	Mod. N wind and head sea. Fine and clear. Bar. 30·00. Ther. 64°. D.B. 54°. W.B. 52°. S.S. 56°.
4.5	At mark-buoy; verified position.
5.20	Set on full speed for Berehaven to anchor.
8.0	Fresh N wind and clear. Mod. westerley swell. Bar. 30·04. Ther. 67°. D.B. 57°. W.B. 52°. S.S. 57°.
8.45	Anchored in Berehaven in 9 fms. water.

HOUR.	
	FRIDAY, JUNE 14th (4th DAY OUT)—*Contd.*
P.M. MID.	Light N wind. Fine and clear. Smooth. Bar. 30·15. Ther. 65°. D.B. 55°. W.B. 52°.
	SATURDAY, JUNE 15th (5th DAY OUT).
A.M. 4.0	Light NNW breeze and cloudy. Fine. Bar. 30·10. Ther. 64°. D.B. 53°. W.B. 50°.
5.0	Hove up anchor and proceeded out of Berehaven by western passage to grappling ground.
8.0	Mod. N'ly wind and sea. Cloudy. Bar. 30·12. Ther. 55°. D.B. 53°. W.B. 53°. S.S. 52°. Stopped ship in grappling position. Position { Lat. 51° 33′·0 N. Lon. 10° 22′·0 W.
	No. 1 Drag.
	Lowered ordinary long prong grapnel with 20 fms. $\frac{3}{4}$" chain and paid out to 140 fms. of rope and chain, and put rounding on and commenced drag.
8.30	Strain = 11 cwt.
9.0	Strain = 11-12 cwt.
9.10	Paid out another 25 fms. of rope.
9.30	Strain rose to 18 cwt. Stopped ship.
9.35	Commenced picking up.
9.55	Grapnel at bows, no cable. Position { Lat. 51° 32′·2 N. Lon. 10° 26′·8 W.
	Set on for new position. Took grapnel inboard and shackled on a heavier one, same type.
10.10	Stopped ship in position. Position { Lat. 51° 32′·2 N. Lon. 10° 26′·8 W.
	Lowered long prong ordinary grapnel with 20 fms. $\frac{3}{4}$" chain and paid out to 150 fms. of 4 × 6 rope and chain, and commenced.

HOUR. A.M.

SATURDAY, JUNE 15th (5th DAY OUT)—*Contd.*

No. 2 Drag.

10.30 Strain = 13-14 cwt.

11.0 Strain = 13-15 cwt.

11.10 Strain = 18 cwt. Stopped ship.

11.12 Commenced picking up.

11.20 Strain = 2-3 tons.

11.25 Strain fell to nil = 60 fms. rope and chain out.

11.28 Grapnel up, no cable.
Position { Lat. 51° 32′·5 N.
Lon. 10° 24′·0 W.
Set on for new position.

11.45 Ship in position.
Position { Lat. 51° 31′·8 N.
Lon. 10° 25′·5 W.
Lowered long prong ordinary grapnel with 20 fms. $\frac{3}{4}$″ chain and paid out to 150 fms. of 4 × 6 rope and chain, put rounding on and commenced

No. 3 Drag.

NOON. Cloudy and overcast, with smooth sea and moderate N. wind.

P.M. Bar. 30·12. Ther. 62°. D.B. 57°. W.B. 52°. S.S. 60°.

0.30 Strain = 14 cwt.

0.35 Strain rose to 3·5 tons. Stopped ship, and stood by to pick up.

0.37 Commenced picking up.

0.53 Stopped picking up. Put stoppers on at bows and put another turn on drum, thus making 5 turns. Resumed picking up.

1.2 Grapnel up, with cable. Stripped outer serving and counted wires, 12 No. 2.

HOUR. P.M.

SATURDAY, JUNE 15th (5th DAY OUT)—*Contd.*

WESTON—WATERVILLE No. 1 1885 CABLE.

Waterville side of fault:

Type No. 8555, 2 cores 90/85 12 No. 2 (=·280" dia.) weighing 8·5 tons per N.M.

Weston side of fault:

Type No. 8554, 2 cores 90/85 12 No. 4½ (=·220" dia.) weighing 5·5 tons per N.M.

1.25 Secured each side of cable with drum ropes.

Position { Lat. 51° 32′·3 N. / Lon. 10° 23′·3 W.

Cut cable and veered away on Weston end.

1.40 Took Waterville end to drum, taking 3 turns.

2.0 Picked up enough over drum for testing.

Cut off 1 fathom damaged.

3.0 Finished testing Waterville end of cable—"O.K." Prepared to buoy end. Sent following telegram to "Silvergray," London:

"Strong westerly winds from Dover. Arrived on ground Friday forenoon. Weather unfit for work. Grappled cable and 'cut in' to-day, Saturday. Tested to Waterville, found 'O.K.,' now about to buoy, 3 p.m., then pick towards Weston."

BUOYING WATERVILLE END AND PICKING UP ON WESTON END.

P.M.

3.0 Bent mooring chain on to Waterville end preparatory to buoying it.

3.10 Lowered cutter and 3 dioptric buoy lamps in her. Paying out moorings for buoy.

3.30 Slipped moorings forward and let go Buoy No. 45, Flag J.

Position { Lat. 51° 32′·3 N. / Lon. 10° 23′·2 W.

Moorings of buoy. 4 cwt. mushroom, 2½ fms. ¾" chain, 20 fms. ⅝" chain, 50 fms. 4×4 rope, 20 fms. ⅝" chain, 10 fms. ¾" chain under buoy, 12 fms. 4×4 side rope, ⅝" bridle, lamp-hanger and flagstaff.

HOUR. P.M.	SATURDAY, JUNE 15th (5th DAY OUT)—*Contd.*
3.35	Sent boat to put lamps on buoy. Took Weston end of cable to drum and commenced heaving in.
3.45	Boat returned to ship and was hoisted.
3.50	Bad place in cable, 6 wires severed at a straightened-out kink, inner serving exposed, put on chain lashing and picked up over drum. Stopped picking up and cut cable 1 fm. seaward of bad place = 8 fms. cut off. Tested cable and found fault to be outboard.
4.0	Mod. NNW wind and smooth sea. Fine, but cloudy. Bar. 30·20. Ther. 61°. D.B. 59°. W.B. 51°. S.S. 58°
4.45	Continned picking up on Weston end, coiling cable in fore tank.
5.0	Bad places in cable coming in; cable flattened in places and kinked up in bights around itself. Stopping at intervals to straighten bends.
5.10	0·162 N.M. picked up. A factory-made taper splice, 12/4's —12/2's, passed off drum. 0·178 N.M. picked up. Bad place.
5.20	0·194 N.M. picked up. Kinks and screwy.
5.25	Cut cable 1 fm. seaward of last bad place and resumed picking up. Length cut off = 0·194 + 1 fm.—8 fms. cut off at 3.50 p.m. = 0·187 N.M. = Piece 1. Tested cable, found fault still outboard.
5.30	Bad place inboard, cable kinked in bights around itself. 0·252 N.M. picked up—bad place off drum.
5.42	0·267 N.M. picked up—kink.
5.45	0·278 N.M. picked up—kink.
5.50	Another bad place; cable in bights; straightened this out.
5.55	From 0·292 N.M. to 0.312 N.M. picked up—3 kinks.
6.0	0·396 N.M. picked up. A ship-made splice 12 No. 4½—12 No. 4½ passed off drum inboard.

HOUR.	SATURDAY, JUNE 15th (5th DAY OUT)—*Contd.*
P.M. 6.3	Cut cable at splice. (A ship-made splice between 12/4½'s, type 8554.) Length cut off = 0·396—0·195 N.M. = 0·201 N.M. = Piece 2. Tested cable and found fault to be inboard. Spoke Weston.
6.30	Resumed picking up.
6.45	0·495 N.M. picked up—kink.
6.47	0·504 N.M. picked up. Stopped picking up and cut cable at last kink. Position { Lat. 51° 31′·7 N. Lon. 10° 23′·5 W. Length cut off = 0·495 N.M.—0·396 N.M. = ·099 N.M. = Piece 3.
7.10	End of cable opened out and handed over to electrician for tests.
7.50	Finished testing cable to Weston. Results satisfactory. Commenced opening out ends of cable for joint and splice, *i.e.*, Weston end, 12 No. 4's, 2 cores, with new cable, 15 No. 9's, 2 cores, on board in after tank.
8.0	Moderate NNW breeze. Fine and clear. Moderate sea. Bar. 30·20. Ther. 60°. D.B. 54°. W.B. 50°. S.S. 56°. Commenced joints. Cut 8 fms. off new cable in after tank. Continual watch kept on cable over bows.
9.50	Sounded in 53 fms., s. Temperature of bottom 48°.
11.0	Finished joints.
11.5	Started splice.
MID.	Finished splice and coiled slack back into after tank. Fresh NNW breeze. Moderate sea. Overcast. Bar. 30·27. Ther. 66°. D.B. 58°. W.B. 55°. S.S. 54°.
	SUNDAY, JUNE 16th (6th DAY OUT).
A.M. 0.15	Commenced paying out cable from after tank towards buoy on Waterville end. Splice passed off drum.

HOUR.	SUNDAY, JUNE 16th (6th DAY OUT)—*Contd.*
A.M. 0.25	Up to buoy. Stopped ship. Lowered boat and sent her to dismantle buoy.
0.45	After shackling on drum rope, slipped buoy.
	MAKING FINAL SPLICE.
0.48	Put stoppers on cable, and took turns off drum.
0.50	Hoisted buoy.
0.52	Commenced heaving in on Waterville end of cable.
1.0	Hoisted boat.
1.10	Resumed heaving in Waterville end.
1.20	Took mushroom inboard.
1.35	Veered away about 25 fms. on Weston end of cable. Enough of Waterville end on board for splice; put stoppers on and slip rope.
1.40	Veered away another 10 fms. on Weston end. Put stoppers on and slip rope. Cut cable Weston end. Length of new cable expended on repair = 0·367 N.M. Length expended by C.R. of cable remaining in after tank = 0·361 N.M., this last length taken as correct. Length remaining in after tank = 4·639 N.M.
2.0	Opened out both ends of cable for joint and splice.
2.35	Handed ends of cable over to testing room.
3.30	Commenced joints. Cut 5 fms. off Weston end.
4.0	Mod. NW breeze and sea overcast. Bar. 30·25. Ther. 59°. D.B. 57°. W.B. 55°. S.S. 54°.
5.30	Finished joints. Started splice.
6.15	Finished splice.
6.18	Veered away on both sides of bight.
6.20	Bent slip stopper on to bight and fitted detacher.
6.30	Let go final splice, thus restoring communication between Weston and Waterville by the 1885 cable. Position { Lat 51° 32′·3 N. Lon. 10° 23′·2 W.

HOUR. A.M.

SUNDAY, JUNE 16th (6th DAY OUT)—*Contd.*

NOTE.—Length of cable cut out of section = 0·495 N.M.
Length of new cable spliced into section = 0·348 N.M.

Decrease in length of section = 0·147 N.M.

Previous length of section = 330·233 N.M.
Present ,, ,, = 330·086 N.M.

DIFFERENCE = 0·147 N.M.

Set on to pick up mark-buoy No. 40 B.

6.50 Came up to buoy, lowered boat, and sent her to dismantle buoy.

7.0 Commenced heaving in moorings.

7.5 Hoisted buoy and boat.

7.25 All buoy's moorings inboard.
Set on full speed for Weston-super-Mare.

STEAMING TO AND AT WESTON-SUPER-MARE.

8.0 Fresh NW breeze and clear weather. Moderate sea.
Bar. 30·18. Ther. 60°. D.B. 57°. W.B. 55°. S.S. 62°.

10.0 Signalled Brow Head.

10.55 Fastnet Rock abeam, distant 1 mile.

11.30 R.M.S. "Lucania" passed, bound west.

NOON Moderate NNW wind and sea. Cloudy.
Bar. 30·16. Ther. 68°. D.B. 59°. W.B. 56°. S.S. 60°.

P.M.
3.5 Old Head of Kinsale abeam, distant 13 miles.

4.0 Similar wind and sea.
Bar. 30·18. Ther. 73°. D.B. 59°. W.B. 55°. S.S. 60°.

8.0 Fresh, following wind and moderate sea.
Bar. 30·20. Ther. 70°. D.B. 60°. W.B. 56°. S.S. 60°.

MID. Bar. 30·25. Ther. 67°. D.B. 59°. W.B. 55°. S.S. 58°.

S.S. "BUCCANEER."

MONDAY, JUNE 17th (7th DAY OUT).

HOUR.

A.M.

4.0 Moderate NW wind and sea. Overcast.
Bar. 30·23. Ther. 67°. D.B. 56°. W.B. 54°. S.S. 58°.

4.50 Lundy Island abeam, distant 10·5 N.M.

8.0 Similar wind and weather.
Bar. 30·12. Ther. 62°. D.B. 58°. W.B. 55°. S.S. 59°.

9.10 Took pilot on board.

10.0 Cable hands turned over picked up cable, Piece 3 = ·099 N.M., from fore to after tank, and Piece 2 = 0·201 N.M., from fore tank on deck alongside after tank, and cut out splice = 7 fms. Stripped this length and tested and found fault to be in it. Turned over Pieces 1 and 2 into after tank.

Top.	CABLE NOW IN AFTER TANK.	
Piece 2	12 No. 4's = 0·194 N.M.	
Piece 1	12 No. 2's = 0·154 N.M. 12 No. 4's = 0·033 N.M.	= 0·187 N.M.
Piece 3	12 No. 4's = 0·099 N.M.	
New cable	15 No. 9's = 4·639 N.M. on top of 55 tons sand ballast.	

NOON. Moderate WNW breeze. Overcast.
Distance run since noon yesterday = 241·0 N.M.
Bar. 30·12. Ther. 70°. D.B. 63°. W.B. 58°.

P.M.

0.5 Let go anchor off Weston-super-Mare.

COMMERCIAL CABLE COMPANY.

WESTON-SUPER-MARE—WATERVILLE (1885)
CABLE REPAIR EXPEDITION.

S.S. "BUCCANEER."

JUNE, 1901.

GENERAL ELECTRICAL REPORT.

GENERAL ELECTRICAL REPORT.

SILVERTOWN,

July 1st, 1901.

To H. BENEST, ESQ.,

Engineer-in-Charge.

DEAR SIR,

I beg to hand to you the accompanying Electrical Report on the Repair effected, June 15th—16th, by S.S. "Buccaneer," on the Commercial Cable Company's Weston-super-Mare — Waterville (1885) Twin-Core Cable.

The Index which accompanies this Report classifies matter dealt with, and indicates the page on which any point of information may be obtained.

Yours faithfully,

EDWARD RAYMOND-BARKER.

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WESTON-SUPER-MARE—WATERVILLE (1885) CABLE REPAIRS FOR THE COMMERCIAL CABLE COMPANY JUNE, 1901 (S.S. "BUCCANEER").

GENERAL ELECTRICAL REPORT.

July 1st, 1901.

The object of this expedition was the cutting out, by S.S. "Buccaneer," of a fault in one of the cores of the Commercial Cable Company's Weston—Waterville (1885) Twin Core Cable. This fault, although, by its variations, giving occasional trouble in duplex adjustments at Weston and at Waterville, did not interfere with the working of the cable.

Loop tests made at Weston, and at Waterville, placed the fault at about 20 N.M. from Waterville in the "Plain" core. The marked or "Rib" core was in no way affected by the fault, and its electrical condition was unimpaired. It was arranged that traffic should continue to pass on both cores until the time came for S.S. "Buccaneer" to cut in for the repair.

On the night of June 10th—11th S.S. "Buccaneer" received on board into after tank, *ex* barge from Messrs. Siemens Bros., Charlton, a length of 5·000 N.M. of Twin-core cable, Siemens' type, 8553, core $\frac{\text{90 lbs. cu. solid wire.}}{\text{85 lbs. G.P.}}$ Length of each core = 5·055 N.M. There was no distinguishing mark on either of the cores, which had merely been labelled with the numbers 1 and 2. For electrical values of cores 1 and 2, *vide* Appendix.

On Tuesday, June 11th, a memorandum from Messrs. Siemens Bros. addressed to the Electrician, S.S. "Buccaneer," giving electrical particulars of the afore-mentioned 5·000 N.M. of cable was received on board S.S. "Buccaneer," and was acknowledged through the Post by Mr. Raymond-Barker.

At 9.50 a.m., on June 11th, S.S. "Buccaneer" left Silvertown works, and after a halt off Gravesend, where Mr. H. Benest and Mr. John Gott joined the ship, S.S. "Buccaneer" proceeded to sea. Mr. John Gott Joined S.S. "Buccaneer" as Representative of the Commercial Cable Company.

On Friday, June 14th, tests on 5·000 N.M. twin core cable in after tank gave satisfactory results. Total length = 10·110 N.M.

C.R. on looped cores = $128{\cdot}15^{\omega}$ ctd.

$$= \frac{128{\cdot}15}{10{\cdot}110} = 12{\cdot}676^{\omega} \text{ per N.M.}$$

C.R. per Factory Electrical value at 75° = $132{\cdot}796^{\omega}$.

Calculated temperature of cable .·. = 58°·9 Fahr. [C.F.T. Tables]. Observed temperature = 56° Fahr.

D.R. test with 72 cells [110 volts by test] ϕ through $1^{\Omega} = 1940$.

Deflection from each core, nil. S.R. = 10,000 m.p. = 1.

On the morning of Friday, June 14th, S.S. "Buccaneer" was in position over fault about 20 miles from Waterville. A mark-buoy was let go in 52 fms., but unfavourable weather prevented any further work being done till the following morning.

On Saturday, June 15th, at 3rd drag (1.0 p.m.) cable was hooked, and brought to bows.

Depth of water = 53 fms. Temperature = 48° Fahr.

Cable hooked: Siemens' type 8555, 12/2.

Cable was cut, 1 fm. being cut off for damaged end, after which ship spoke Waterville on D.C. morse, and made tests:

C.R. { Plain core = 253·47 ω ctd. at S.T.
Rib ,, = 252·79 ,, ,,

Distance to Waterville Office by C.R. = 20·191 N.M.

Test for insulation with 30 volts:

D.R. { Plain core 1st min. electn. Total = 198 Ω : per N.M. = 3998 Ω
Rib ,, ,, ,, ,, = 198 ,, = 3998

After ship and shore had exchanged messages, ship buoyed Waterville end (3.30 p.m.) and started to pick up on Weston end.

At a distance of 7 fms. from end, cable was found badly damaged, with several sheathing wires broken. Cable was cut to seaward of damaged place. (Total cut off = 8 fms.)

Ship then spoke to Weston and made tests for insulation with 30 volts. Distance to Weston = 310·969 N.M. (core).

D.R. { Plain core. Total D.R. = 2779 ohms. (Res. to earth of fault.)
Rib core 1st min. Total D.R. = 24·750 Ω : per N.M. = 7697 Ω.

Ship continued to pick up, and at 5 p.m. a splice, followed by a very bad pulled-out kink, came on board followed by much slack cable in festoons.

At 5.25 p.m., cable was cut seaward of another bad kink.

Cable picked up, called Piece 1 = 0·182 N.M.

Tests to Weston (5.45 p.m.) showed fault in Plain core to be still seaward of ship.

Ship continued to pick up, and at 6 p.m. another splice came in beyond which cable was Siemens, type 8554, 12/4.

Cable was cut (6.3 p.m.) just beyond this second splice. Piece picked up was called Piece 2 = 0·206 N.M.

Fault was found to be in Piece 2:

D.R. { Plain core. Total D.R. = 2829 ohms. (Res. of fault to earth.)
Rib core D.R. perfect.

Ship's tests to Weston (6.33 p.m.) were found to give satisfactory results.

Insulation tests with 30 volts:

D.R. { Plain core 1st min. elec. Z to L. Total = 26·053 Ω : per N.M. = 8094 Ω.
Rib core 1st min. elec. Z to L. Total = 24·750 Ω : per N.M. = 7689 Ω.

Ship had started to make test for C.R. when, on a further length of cable being picked up, a bad kink was brought in on board, the cable being subsequently cut (6.50 p.m.) seawards of this bad place. Piece picked up called Piece 3 = 0·098 N.M.

Ship made test for C.R. on Weston end. Distance to Weston = 310·581 N.M. (core).

C.R. { Plain core. Total = 3939·6 ω ctd. = 12·684 ω per N.M. at S.T.
Rib ,, Total = 3934·9 ctd. = 12·669 ,, ,, ,,

Test for insulation (with 30 volts) on Weston end:

D.R. { Plain core. Total = 27·501 Ω : per N.M. = 8530 Ω.
Rib core. Total = 23·572 Ω : per N.M. = 7312 Ω.

Sounding made. Depth = 53 fms. Temp. = 48° Fahr.

Two joints and a splice were then effected between the Weston end (twin core cable, Siemens' type 8554, 12/4) and the new cable in S.S. "Buccaneer's" after tank (Siemens' type 8553, 15/9), this operation being completed at midnight.

On Sunday, June 16th, 1901, at 0.15 a.m., S.S. "Buccaneer" started to pay out cable towards buoy on Waterville end. Total cable in circuit (each core) = 315·628 N.M. (core).

D.R. { Plain core: 1′ Elec. Z to L: Total = 27·501 Ω per N.M. = 8680 Ω.
Rib core: 1′ Elec. Z to L: Total = 23·572 per N.M. = 7440.

Tests during paying-out were satisfactory.

At 2.5 a.m. the Waterville end was brought in on board.

The following results of Waterville's tests on Waterville buoyed end were then communicated to ship :

Plain core :	Z = 103 Ω	Total D.R. equivalent to	2079	per N.M.
	C = 69	,, ,, ,,	1393	,,
Rib core :	Z = 165	,, ,, ,,	3332	,,
	C = 93·5	,, ,, ,,	1888	,,
Capacity :	Plain core :	Total = 6·423 mfds. = to	0·3181 mfd.	per N.M.
	Rib core :	,, = 6·269 ,, ,,	0·3105 ,,	,,

At 2.25 a.m. the cable was cut in ship's after-tank, after a further length had been veered away during the picking up of the Waterville end.

Total length each core paid out = 0·365 N.M. (by C.R.).
,, ,, cable paid out = 0·361 N.M.

Ship's tests on new Weston end. Length of each core = 310·937 N.M.

C.R.	Plain core :	Total = 3948·3 ω	calculated = 12·698 ω	per N.M. at S.T.
	Rib core :	Total = 3944·4	calculated = 12·686	per N.M. at S.T.

Mean cable temperature { Calculated from Plain core = 52°·6 Fahr.
,, ,, Rib core = 52°·6 Fahr.

At 3.15 a.m., after despatch of messages from ship to Waterville, "G.B." was exchanged between ship and Weston and ship and Waterville respectively, the cable ends being then handed over for effecting of the final splice.

At 3.30 a.m. the joints for the twin-cores were started, and by 6.15 a.m. the splice was completed, the bight being slipped at 6.30 a.m.

On Monday, June 17th, the fault in Piece 2 was localized by Loop test, and was found at a discolouration in the gutta percha, at a splice (though not at the actual joint) and at a distance of 3 fms. from the top end of Piece No. 2. The fault itself had apparently been caused by the Teredo. A length of 7 fms. of core, including the fault, and cut from top end of Piece No. 2, was taken by Mr. John Gott for microscopic examination.

At 0.5 p.m. S.S. "Buccaneer" anchored off Weston-super-Mare.

On Tuesday, June 18th, the following results of tests made by Weston and by Waterville on the Weston-Waterville 1885 cable after "Buccaneer" repair, were received by Mr. John Gott, the Commercial Cable Company's Representative on board S.S. "Buccaneer."

Weston Tests.

Plain core: Mean of all readings:

	Z: 27·84 abs.	9202 per N.M.	C.R. corrected $=8413^{\omega}$
	C: 25·13 ,,	8307 ,, ,,	
Rib core:	Z: 30·45 ,,	10064 ,, ,,	
	C: 26·81 ,,	8860 ,, ,,	

Non Earth: Mean of all readings: C to Plain 28·08 Ω abs. 9280 N.M.
Z to ,, 26·79 ,, 8854 ,,

Waterville Tests.

Plain Z = 4592 Ω. C = 9228 Ω
Rib Z = 14910. C = 6584

Both by "non earth": Z to Plain = 10230 Ω; C to Plain = 8633

C.R. corrected: Plain = $4207{\cdot}5^{\omega}$; Rib = $4201{\cdot}5^{\omega}$

Note.—Total C.R. (by Factory Electrical value at 75° Fahr.) of Plain core + Rib core, including Waterville Land-line = $8835{\cdot}43^{\omega}$.

∴ On basis of Weston's observed C.R., Mean Temperature of sea bottom = 53° Fahr.

On basis of Waterville's observed C.R., Mean Temperature of sea bottom = 52°·8 Fahr.

[Using Clark, Forde, Taylor Tables for Copper.]

WESTON-WATERVILLE (1885) TWIN CORE CABLE.

Data regarding Revision of Lengths after Repair by "Buccaneer."

	N.M.
Original length of cable before repair (not including 0·221 N.M. Waterville L.L.)...	=330·233
Original cable remaining	=329·738
Cable cut out of line	= 0·495
Original cable before repair (not including Waterville L.L.)	=330·233
Cable cut out of line	= 0·495
Original cable remaining	=329·738
New cable laid in	= 0·348
Length after repair	=330·086
Cable cut out of line	= 0·495
New cable laid into line	= 0·348
Decrease	= 0·147
Original cable before repair (not including Waterville L.L.)	=330·233
Decrease	= 0·147
Length since repair	=330·086

To which must be added 0·221 N.M. Waterville L.L.

Total length by core (not including Waterville L.L. of 0·221 N.M.) =330·902 N.M.

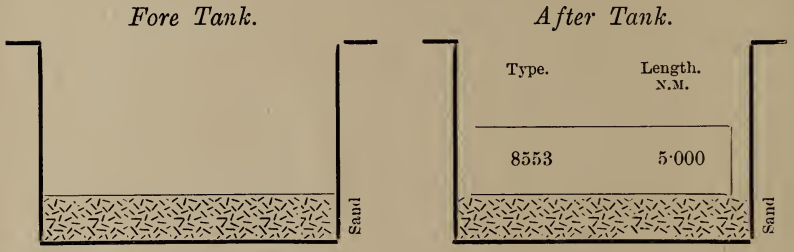
EDWARD RAYMOND-BARKER.

FACTORY ELECTRICAL VALUES AT 75° F. OF TWIN CORE CABLE, SHIPPED ON BOARD S.S. "BUCCANEER," JUNE 11TH, 1901.

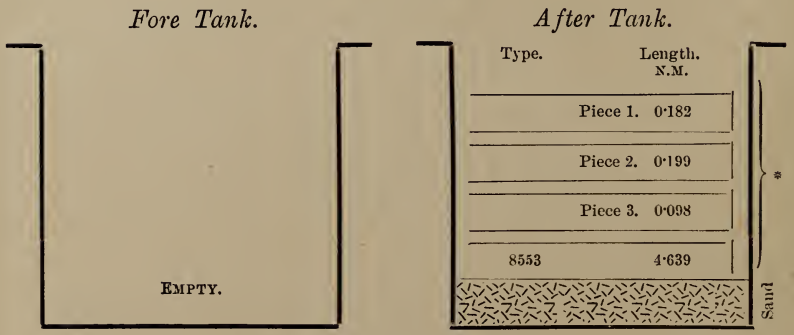
Type, Siemens' 8553, $\frac{\text{Core 90 lbs. cu. solid wire}}{\text{85 lbs. G.P.}}$ per N.M.

Type.	Length N.M.	No. of Wire.	C.R. at 75° F.		Capacity.		D.R. at 75° Fahr.	
			Total.	Per N.M.	Total.	Per N.M.	Total.	Per N.M.
8553	5·000 (Cable)	1	66·372	13·13	1·6702	0·3304	472·81	2390
,,	5·055 (Core)	2	66·424	13·14	1·6636	0·3291	580·62	2935

CABLE ON BOARD S.S. "BUCCANEER," JUNE 11TH, 1901.



CABLE ON BOARD S.S. "BUCCANEER" ON RETURN TO SILVERTOWN WORKS, JUNE 25TH, 1901.



* Turned over *ex* Fore Tank, June 17th.

EXPENDITURE NEW CABLE, SIEMENS' TYPE 8553, TWIN CORE, WESTON—WATERVILLE REPAIR.

Tank.	Type.	Cut off for Splices. N.M.	Laid. N.M.	Remaining on Board. N.M.	Total Shipped. N.M.
After.	Siemens' 8553	0·008 + 0·005 = 0·013	0·348	4·639 (Core=4·690)	5·000 (Core=5·055)

EXPENDITURE CABLE PICKED UP. Total = 0·495 N.M.

	N.M.	N.M.	
Viz.: Piece	1 = 0·182	= 0·479	in "Buccaneer's" after tank.
,,	2 = 0·199		
,,	3 = 0·098		

Cut off for damaged end = 0·001
Cut off for damaged place = 0·008
Cut out with fault = 0·007

0·495 N.M.

FACTORY ELECTRICAL VALUES AT 75° FAHR. OF CABLE ON BOARD S.S. "BUCCANEER" ON HER RETURN TO SILVERTOWN WORKS, JUNE, 1901.

Type.	No. of Wire.	Length.		C.R. at 75° Fahr.		Capacity.		D.R. at 73° Fahs.	
		Cable.	Core.	Total.	Per N.M.	Total.	Per N.M.	Total	Per N.M.
8553	1	4·639	4·690	61·580	13·13	1·5496	0·3304	509·6	2390
	2			61·627	13·14	1·5435	0·3291	625·8	2935
Piece 1	Plain		0·182	2·433	13·37	0·0556	0·3055	...	...
	Rib			2·428	13·338	0·0540	0·2966	...	...
2	Plain		0·199	2·661	13·37	0·0608	0·3055	...	...
	Rib			2·654	13·338	0·0590	0·2966	...	...
3	Plain		0·098	1·293	13·197	0·0295	0·3006	...	...
	Rib			1·292	13·18	0·0290	0·2960	...	...

FACTORY ELECTRICAL VALUES AT 75° FAHR.

OF THE WESTON—WATERVILLE (1885) TWIN CORE CABLE AFTER REPAIR BY S.S. "BUCCANEER," JUNE 16TH, 1901.

[Not including 0·221 N.M. Waterville Land-line (Core $\frac{90\ Cu.}{85\ G.P.}$).]

PLAIN CORE.

Length of Section. N.M.	Length. Total N.M.	C.R. at 75° Fahr.			Capacity.			Remarks.
		Total of Section.	Sum of Totals.	Per N.M. of Section.	Total of Section.	Sum of Totals.	Per N.M. of Section.	
WESTON.		ω		ω	mfds.		mfd.	
3·845		52·03		13·54	1·185		0·3082	"Bittern."
			ω			mfds.		
14·304	18·149	190·80	242·83	13·342	4·342	5·527	0·3036	
1·022	19·171	13·61	256·44	13·342	0·309	5·836	0·3036	
0·671	19·842	8·95	265·39	13·342	0·203	6·039	0·3036	"Marmion."
3·598	23·440	47·67	313·06	13·25	1·202	7·241	0·334	
1·109	24·549	14·80	327·86	13·342	0·336	7·577	0·3036	
1·089	25·638	14·26	342·12	13·10	0·329	7·906	0·3022	
1·782	27·420	23·77	365·89	13·34	0·539	8·445	0·3025	"Mirror."
5·831	33·251	77·80	443·69	13·34	1·765	10·210	0·3027	
1·561	34·812	27·32	471·01	17·51	0·498	10·708	0·3192	"M.B." Rockport Type.
1·249	36·061	16·63	487·64	13·32	0·377	11·085	0·3019	
0·285	36·343	3·86	491·50	13·55	0·087	11·172	0·3054	"Mirror."
0·630	36·976	8·51	500·01	13·51	0·194	11·366	0·3079	
12·988	49·964	173·38	673·39	13·35	3·930	15·296	0·3027	
8·460	58·424	113·84	787·23	13·46	2·570	17·866	0·3038	
18·524	76·948	245·91	1033·14	13·28	5·580	23·446	0·3013	
14·431	91·379	194·04	1227·18	13·45	4·407	27·853	0·3055	
26·201	117·580	346·42	1573·60	13·22	7·845	35·698	0·2995	
63·925	181·505	849·38	2422·98	13·29	19·133	54·831	0·2993	
31·575	213·080	425·45	2848·43	13·48	9·595	64·426	0·3040	
86·660	299·740	1154·08	4002·51	13·32	26·098	90·524	0·3011	
10·841	310·581	143·07	4145·58	13·197	3·259	93·783	0·3006	
0·351	310·932	4·61	4150·19	13·13	0·116	93·899	0·3304	S.S. "Buccaneer," June 16th, 1901.
11·692	322·624	156·31	4306·50	13·37	3·571	97·470	0·3055	
0·340	322·964	4·48	4310·98	13·17	0·113	97·583	0·333	"Marmion."
7·938	330·902	106·13	4417·11	13·37	2·425	100·008	0·3056	
WATERVILLE BEACH.								

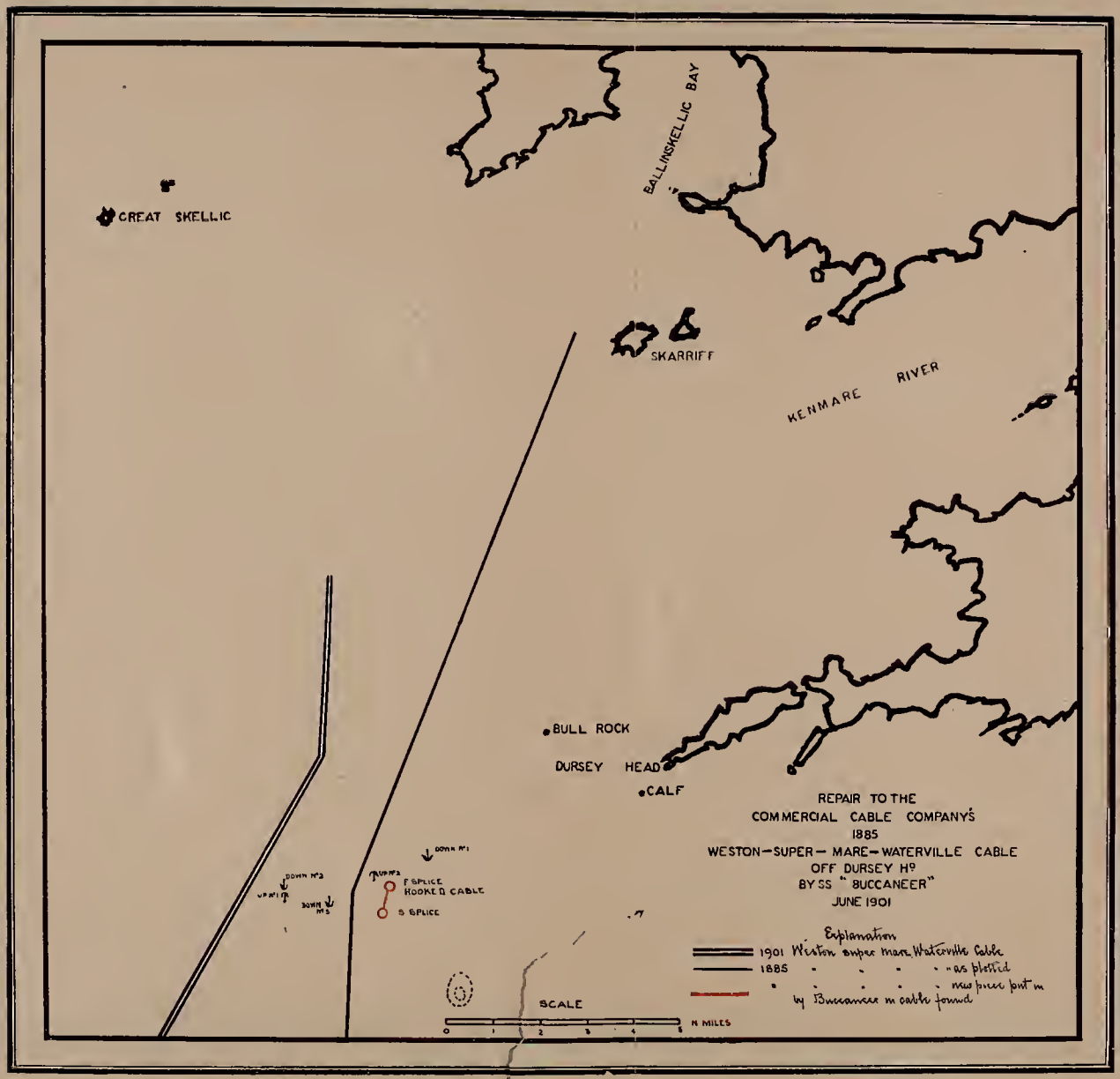
FACTORY ELECTRICAL VALUES AT 75° FAHR.

OF THE WESTON—WATERVILLE (1885) TWIN CORE $\frac{90 \text{ Cu.}}{85 \text{ G.P.}}$ CABLE AFTER REPAIR BY S.S. "BUCCANEER," JUNE 16TH, 1901.

[Not including 0·221 N.M. Waterville Land-line (Core $\frac{20}{85}$).]

RIB CORE.

Length of Section. N.M.	Length Total N.M.	C.R. at 75° Fahr.			Capacity.			Remarks.
		Total of Section.	Sum of Totals.	Per N.M. of Section.	Total of Section.	Sum of Totals.	Per N.M. of Section.	
WESTON.								
3·845		51·94		13·51	1·165		0·303	"Bittern."
14·304	18·149	191·00	242·94	13·35	4·248	5·413	0·297	
1·022	19·171	13·64	256·58	13·35	0·303	5·716	0·2966	
0·671	19·842	8·96	264·54	13·35	0·199	5·915	0·2966	"Marmion."
3·598	23·440	47·63	313·17	13·24	1·202	7·117	0·334	
1·109	24·549	14·80	327·98	13·35	0·329	7·446	0·297	
1·089	25·638	14·24	342·22	13·10	0·335	7·781	0·308	
1·782	27·420	23·76	365·98	13·34	0·527	8·308	0·2959	"Mirror."
5·831	33·251	77·84	443·82	13·36	1·725	10·033	0·2959	
1·561	34·812	27·32	471·14	17·5	0·498	10·531	0·3192	"M.B." Rockport type.
1·249	36·061	16·83	487·97	13·5	0·369	10·900	0·2956	
0·285	36·346	3·85	491·82	13·5	0·086	10·986	0·3018	"Mirror."
0·630	36·976	8·49	500·31	13·5	0·191	11·177	0·3031	
12·988	49·964	173·38	673·69	13·35	3·843	15·020	0·296	
8·460	58·424	114·71	788·40	13·56	2·527	17·547	02·987	
18·524	76·948	245·56	1033·96	13·26	5·529	23·076	0·2986	
14·431	91·379	195·19	1229·15	13·52	4·380	27·456	0·3036	
26·201	117·580	347·62	1576·77	13·27	7·744	35·200	0·2956	
63·925	181·505	847·69	2424·46	13·26	18·854	54·054	0·295	
31·575	213·080	421·04	2845·50	13·33	9·565	63·619	0·303	
86·660	299·740	1153·23	3998·73	13·30	25·724	89·343	0·2969	
10·841	310·581	142·92	4141·65	13·18	3·209	92·552	0·2960	
0·351	310·932	4·61	4146·26	13·14	0·116	92·668	0·3291	SS. "Buccaneer." June 16th, 1901.
11·692	322·624	155·92	4302·18	13·338	3·468	96·136	0·2966	
0·340	322·964	4·48	4306·66	13·17	0·113	96·249	0·3330	"Marmion."
7·938	330·902	105·80	4412·46	13·338	2·354	98·603	0·2966	
WATERVILLE BEACH.								


GREAT SKELLIC
BALLINSKELLIG BAY
SKARRIFF
KENMARE RIVER
BULL ROCK
DURSEY HEAD
CALF
DOWN No1
UP No2
DOWN No2
UP No1
DOWN No3
F SPLICE
HOOKED CABLE
S SPLICE
REPAIR TO THE
COMMERCIAL CABLE COMPANY'S
1885
WESTON-SUPER-MARE-WATERVILLE CABLE
OFF DURSEY Hd
BY SS "BUCCANEER"
JUNE 1901
Explanation
1901 Weston super mare Waterville Cable
1885 " " " " as plotted
" " " " was picked up in by Buccaneer in cable formed
SCALE
0 1 2 3 4 5 N MILES

Weston—Waterville (1885) Cable Repairs.

BRISTOL CHANNEL.

REPAIR

TO THE

Weston—Waterville (1885) Cable.

1902.

GENERAL INDEX.

Weston—Waterville (1885) Cable Repair Expedition, 1902.

S.S. "BUCCANEER."

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COMMERCIAL CABLE COMPANY'S CHARTER.

Weston—Waterville (1885) Cable Repairs.

JANUARY, 1902.

S.S. "BUCCANEER."

GENERAL REPORT.

Silvertown,
London, E.,
January 20th, 1902.

M. H. Gray, Esq.,
Silvertown.

Dear Sir,

We left Silvertown at 11.45 a.m. on January 11th, passing Gravesend at 4.30 p.m. After a fair weather run we arrived off Bideford at 3.45 p.m. on the 13th, and anchored there for the night, as Mr. Gott could not get off to ship before morning.

Mr. Gott joined ship Tuesday morning, 14th, and said that the fault in "rib" core was near final splice, 23 miles west of Lundy. The "plain" core was intact and working, the "rib" one giving dead earth. We proceeded to position and dropped mark buoy and started dragging in 38 fathoms. On Drag 3 got cable and spoke Weston. Tests O.K. to Weston, but Waterville side showed complete break, giving dead earth close to ship. Buoyed Weston end, and picked up towards Waterville, recovering ·109 N.M. to broken end. This proved to be the fault. Cable had been damaged so that only one or two wires were holding, all others showing old fracture. This is supposed to have been done by a trawler. Proceeded to drag again, and on Drag 11—Wednesday, 15th—hooked cable. Cable still faulty towards Waterville, showing fresh break. Picked up 0·477 N.M. to original fault Waterville end. Some time was lost here, owing to boat which had been sent away to replace lights on Weston buoy not being able to get back to ship on account of wind and tide, so ship had to go and pick her up. As all hands had been working through previous night, I stopped work for night and dodged till daylight. On morning of 16th picked up towards Waterville 1·066 N.M., and broken end came in. This was a clean break, and appears to have been damaged by a trawler as in the original fault,

and the final break caused by grapnel, which, from appearances, had evidently been over cable close to. On the same evening on Drag 18 we hooked cable to westward of fault, and spoke and tested to Waterville "O.K." In order to take advantage of the fine weather we spliced Waterville end on to tank end, and paid out towards Weston end 2·638 N.M., dropping final splice on Friday, 17th, in 40 fms., and after clearing the ground of cable and buoys, and as Mr. Gott did not wish to put in anywhere to take final tests, sailed for London at 3.50 p.m., Friday, 17th, arriving after a good run—with the exception of about six hours' delay off Dungeness owing to fog—at Gravesend, 7 p.m., Sunday, 20th. On arrival there Mr. Gott heard that tests on the cable were "O.K." I am glad to say that Mr. Gott expressed himself as very pleased with the way the work was conducted.

As regards the nature of the sea bottom on which we were working, the Admiralty charts show a depth of 40 fms. with fine sand. We found the bottom hard in places, more like cement, over which the grapnel showed practically no dragging strain, and the cable on this hard bottom was fast to the bottom with marine growth.

The amount of new cable used on this repair was 2·638 N.M., and the picked up cable, which is all good for relaying = 2·521 N.M. This is in four pieces, which Mr. Gott wishes spliced up to the remaining new cable. The extra length of cable after repair is 0·133 N.M. Indicator length. I will hand you the Engineering and Electrical Log in a few days.

In conclusion I should mention the admirable way in which all departments on the ship worked together during this repair.

I am, dear Sir,

Yours faithfully,

F. C. CRAWFORD.

THE COMMERCIAL CABLE COMPANY'S CHARTER.

Bristol Channel Repairs,

JANUARY, 1902.

S.S. "BUCCANEER."

ENGINEER'S DIARY.

LIST OF STAFF, OFFICERS, CABLE HANDS AND CREW.

LIST OF STAFF, OFFICERS, AND CREW.

Mr. F. C. Crawford,	Engineer in Charge.
,, H. E. Cann,	Electrician.
,, E. H. Walker,	Accountant.
,, T. W. Sharp,	Master.
,, A. Troan,	Chief Officer.
,, H. A. Ridsdale,	2nd ,,
,, A. J. Clunie,	3rd ,,
R. Murray,	Carpenter.
J. Kelly,	Boatswain.
J. Dickins,	,, Mate.
4 Quartermasters.	
6 Able Seamen.	
1 Deck Boy.	
Mr. A. White,	Chief Engineer.
,, W. McFarlane,	2nd ,,
,, C. Ball,	3rd ,,
,, J. Ketley,	4th ,,
J. Maguire,	Donkeyman.
6 Firemen.	
4 Trimmers.	
A. Patrick,	Chief Steward.
B. Jardine,	2nd ,, and Storekeeper.
C. H. Benson,	Chief Cook and Baker.
T. Templeton,	2nd ,, and Butcher.
H. Short,	Pantryman.
P. Neville,	Engineers' Steward.
H. Dunlop,	Assistant Steward.
J. Gibson,	Officers' Boy.
J. Kingston,	Scullion.

CABLE HANDS.

W. Tillyer,	Foreman.
B Butcher,	Leading Hand.
R Keys,	,, ,,
R. Schwartz,	Lamps and Stores.
C. J. Cakebread,	Cable Hand.
R. Duncan,	,, ,,
W. Mack,	,, ,,
A. Smith,	,, ,,
R. Molt,	Jointer.
H. Livingstone,	Fitter.
A. E. Newton,	Fitter's Mate.

Mr. J. Gott, Representative of Commercial Cable Co., joined ship off Bideford on January 14th.

Staff	3
Cable Hands	11
Officers and Crew	42
Total persons on board on leaving London ...	56

COMMERCIAL CABLE COMPANY'S CHARTER.

BRISTOL CHANNEL REPAIRS, 1902.

S.S. "BUCCANEER."

CONSTANTS FOR PICKING-UP AND PAYING-OUT DRUM.

Circ. of Drum = 17′ 2½″

Type.	Circ. in inches.	Revs. per N.M.	Log.	Fms. per Revs.
Siemens' L.I.	3·465	347·886	2·5414375	2·916
Grappling Rope—				
4 × 6, old	4·646	345·940	2·5390016	2·932
Buoy Rope—				
(Steel and Manilla)				
4 × 4, new	3·860	347·233	2·5406213	2·922
3 × 3, new	2·700	349·159	2·5430228	2·905

COMMERCIAL CABLE COMPANY'S CHARTER.

BRISTOL CHANNEL REPAIRS, 1902.

S.S. "BUCCANEER."

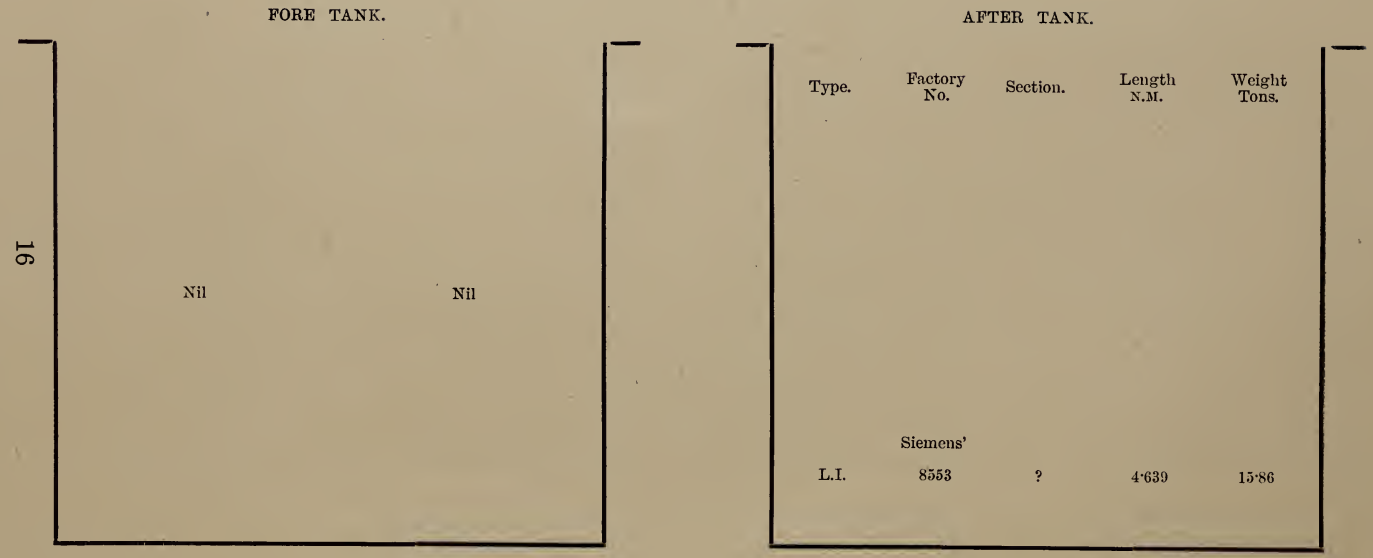
DISTRIBUTION OF WEIGHT IN SHIP ON LEAVING GRAVESEND.

	Tons.
Cable in fore tank	—
Ballast ,, ,, ...	—
Cable in after ,, ...	15·86
Ballast in after ,, ...	—
Coal in bunkers	265·00
Fresh water in after fresh water tank	13·00
,, ,, ,, fore cone	8·00
,, ,, ,, side tanks	4·50
Water in ballast tanks forward	75·00
,, ,, ,, ,, aft	10·00
Boatswain's stores forward	2·50
Carpenter's ,, ,, ...	·50
Cable stores and buoys	11·00
Engine room stores	3·50
Water in main boilers	30·00
Steward's stores	6·75
Extra chain cable	1·00
Spare anchors' ropes	2·00
,, propeller	3·00
Deck machinery	10·00
Total ...	461·61

Draught of ship { Fore 11′ 6″ / Aft 12′ 9″ } mean 12′ 1½″.

January 11th, 1902.

DISTRIBUTION OF CABLE IN SHIP ON LEAVING GREENHITHE.



January 11*th*, 1902.

DESCRIPTION OF CABLE.

TWIN CORE CABLE.

Siemens' L.I. Type.—Their Factory No., 8553.

Conductor :—Solid plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs. per N.M.

Two cores as above—one marked with a "Rib" the other plain—laid up, wormed and served with tanned jute yarn.

Sheathing :—15 G homo wires, No. 9, L.S.G. = ″·144 dia. when galvanised.

Breaking strain = 57 tons per square inch. Elongation = 9·4 %.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with 3 coats of compound.

Ex. diameter = 1″·103.

Weight in air dry = 3·293 tons per N.M.
,, ,, wet = 3·420 ,, ,,
,, in sea water = 2·241 ,, ,,

The above particulars taken from sample.

JANUARY, 1902.

COMMERCIAL CABLE COMPANY'S CHARTER.

BRISTOL CHANNEL REPAIRS, 1902.

ENGINEER'S GENERAL DIARY.

S.S. "BUCCANEER."

STEAMING FROM LONDON TO BIDEFORD.

S.S. "BUCCANEER."

HOUR.	SATURDAY, JANUARY 11th (1st DAY OUT).
A.M. 8.30	Commenced unmooring ship (off Works, Silvertown).
11.30	Finished unmooring. All hands joined ship.
11.45	Cast off all moorings and proceeded down river, Pilot Twist in charge.
P.M. 1.12	Brought up off Greenhithe to mooring buoy for adjusting compasses. Tug "Rescue" assisting in swinging ship.
	Note.—This tug was hired on account of tug ordered, not being there.
3.35	Finished adjusting compasses.
	Sent the following telegram :—
	"CHIEF OFFICER, Coastguard Station, Bideford, Devon.
	Shall be much obliged if you could advise Mr. Gott, Royal Hotel, Bideford, when telegraph steamer 'Buccaneer' is off bar. Please advise me if any expenses incurred. 'Buccaneer' due Monday afternoon.
	M. H. GRAY, Telegraph Works, Silvertown, Essex."
3.45	Cast off from moorings, and proceeded down river.
4.35	Off Gravesend. Pilot Twist left; Pilot Letten boarded.
6.0	Nore Light vessel abeam.
8.45	North Foreland abeam.
10.15	South Foreland abeam.
10.30	Dover pier works light vessel abeam, distant 1·5 N.M.
MID.	Moderate S by W breeze, and overcast.

HOUR.	SUNDAY, JANUARY 12th (2nd DAY OUT).
A.M.	
0.35	Dungeness Light abeam, distant 1·5 N.M.
3.55	Beachy Head Light abeam, 3·25 N.M.
4.0	Light variable airs. Overcast and hazy. Smooth sea.
8.0	Swung ship for compass errors. Light S by E wind. Fine clear weather. Bar. 30·10. Ther. 65°.
10.30	Stopped ship off Ventnor (Isle of Wight). Pilot Letten left ship.
10.35	Set on full speed again.
10.55	St. Catherine's abeam, distant 3 N.M.
NOON	Moderate WSW wind. Fine clear weather. Bar. 30·05. Ther. 57°. Distance run from London = 183·0 N.M.
P.M.	
1.30	Passed cable s.s. "Britannia" bound up Channel.
2.51	Portland Bill abeam, distant 8·8 N.M.
4.0	Light variable airs. Fine weather. Smooth sea. Bar. 30·08. Ther. 56°.
7.35	Start Point abeam, distant 8·0 N.M.
8.0	Light variable wind. Fine clear weather. Bar. 30·07. Ther. 56°. Cable hands employed during the day getting all gear in order for grappling. Mechanics overhauling cable and sounding machinery.
11.30	Eddystone Light abeam.
MID.	Light variable airs. Fine weather. Smooth sea. Bar. 30·11. Ther. 65°.

HOUR.	MONDAY, JANUARY 13th (3rd DAY OUT).
A.M.	
2.10	Lizard Lights abeam, distant 7·0 N.M.
4.0	Light variable airs. Fine clear weather. Smooth sea. Bar. 30·13. Ther. 51°.
4.35	Wolf Rock abeam, distant 2·0 N.M.

HOUR.	MONDAY, JANUARY 13th (3rd DAY OUT)—*Contd.*
A.M. 8.0	Fresh NE breeze and clear weather. Bar. 30·02. Ther. 56°.
NOON.	Fresh NE breeze and overcast. Moderate sea. Bar. 30·25. Ther. 56°. Position by observation { Lat. 51° 4′·0 N. / Lon. 4° 47′·0 W. Distance run since noon yesterday = 223·0 N.M.
P.M. 1.0	Stopped ship and signalled Lundy Island: "Report me all well."
1.45	Proceeded towards Barnstaple Bay.
2.15	Stopped and took Bristol Channel pilot on board.
2.20	Proceeded towards Bideford.
3.45	Anchored in Bideford Roads.
4.0	Mr. Crawford went on board steam barge "Ralph," and sent telegram and letter to Mr. Gott *re* joining ship. As Channel pilot would not take ship over Bar, and said it would not be safe to send our boat in, Mr. Crawford arranged with a fisherman who was on board "Ralph" to bring Mr. Gott to "Buccaneer" in morning.
4.30	Mr. Crawford returned to ship.
8.0	Fresh NE breeze and clear weather. Bar. 30·25. Ther. 53°. Cable hands employed during the day placing 40 class buoys in rigging and preparing moorings for same. Mechanics working at dynamometer. Cable flushed down with water.
MID.	Moderate E by S wind and overcast. Bar. 30·40. Ther. 50°.
	TUESDAY, JANUARY 14th (4th DAY OUT).
A.M. 4.0	Fresh ESE wind and overcast. Bar. 30·38. Ther. 49°.
8.0	Fresh ESE wind and overcast. Bar. 30·51. Ther. 57°.

HOUR.

TUESDAY, JANUARY 14th (4th DAY OUT)—*Contd.*

A.M.

9.30 Mr. Gott came out from shore in schooner, lowered boat and sent her away to same.

9.45 Mr. Gott arrived on board, hoisted up boat.

9.55 Hove up anchor and set on for Morte Bay, to pilot cutter.

10.40 Discharged pilot and proceeded towards cable ground.

NOON. Moderate ESE breeze and fine weather.
Bar. 30·62. Ther. 52°.
Position by observation { Lat. 51° 12′·3 N. / Lon. 4° 37′·0 W.
Distance run since leaving Bideford = 24·7 N.M.
Steamed to North end of Lundy Island to take departure for running 23 N.M. to put down Mark Buoy.
Course S 88° W. Distance 23·5 N.M.

P.M.

2.25 In position to put down Mark Buoy. Sounding No. 1 = 38 fms. h. n.sn.

2.30 Paid out buoy's moorings and streamed buoy No. 42, "P" flag.
Buoy's moorings = $\frac{5}{8}$″ bridle, 50 fms. $\frac{5}{8}$″ chain mushroom = 5 cwts., 0 qrs., 3 lbs.
Position of Mark Buoy { Lat. 51° 10′·5 N. / Lon. 5° 17′·5 W.

2.35 Lowered cable cutter and sent her away to put lights on buoy.

2.45 Boat returned to ship and was hoisted.

GRAPPLING FOR WESTON—WATERVILLE 1885 CABLE.

Drag No. 1.

3.0 In position to grapple. Lowered ordinary long prong grapnel with 20 fms. $\frac{3}{4}$″ chain, and commenced paying out 4 × 6 rope.

3.5 Paid out to 70 fms. of rope and chain. Engines slow = (17 revs.).

3.7 Sounding No. 2 = 38 fms. h. n.sn.

HOUR.	TUESDAY, JANUARY 14th (4th DAY OUT)—*Contd.*
P.M. 3.30	No strain.
3.50	Paid out to 80 fms. of rope and chain.
4.10	No strain. Commenced picking up.
4.20	Grapnel at bows ; no sign of cable. Set on for new position.
	DRAG No. 2.
4.24	In position. Lowered same grapnel with 20 fms. $\frac{3}{4}$" chain and commenced paying out 4 × 6 rope.
4.30	Paid out to 80 fms. of rope and chain. Engines slow= 17 revs.
4.45	No strain.
4.55	Paid out to 100 fms. of rope and chain.
5.0	Took weights off dynamometer.
5.5	Strain rose to 18 cwt.
5.20	,, ,, ,, 25 cwt. and fell to 18.
5.30	,, steady at 18 cwt. Stopping ship occasionally to reduce speed.
6.0	Strain steady at 18 cwt.
6.25	,, rose to 50 cwt. Commenced to pick up.
6.32	,, fell to 10 cwt. (42 fms. out).
6.40	Grapnel at bows. No sign of cable. Set on for new position.
	DRAG No. 3.
7.15	In position. Lowered same grapnel with 20 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 6 rope.
7.22	Paid out to 100 fms. of rope and chain. Engines slow= 17 revs.
7.23	Strain suddenly rose to 140 cwt. Stopped ship. Paid out a few fathoms. Strain fell. Slow ahead.

S.S. "BUCCANEER."

HOUR. P.M.	TUESDAY, JANUARY 14th (4th DAY OUT)—*Contd.*
7.25	Strain again rose to 30 cwt. Stopped ship. Commenced picking up.
7.30	40 fms. of rope and chain out. Strain=80 cwt.
7.43	Grapnel at bows with cable. Siemens' L.I. twin core, No. 8553. Set about bending on seizing chains of drum ropes.
8.0	Fresh easterly wind. Clear weather. Bar. 30·70. Ther. 47°.
8.5	Cut cable, got grapnel inboard, and took grappling rope off drum.
8.15	Hove port end (Weston end) inboard. *Cut 1 fm. off* (damaged).
8·30	Commenced testing cable towards Weston.
8.50	Finished testing Weston end. O.K. Sealed ends.
.9.15	Veered away on Weston end, and picked up on Waterville end by winch.
9.20	Enough Waterville end inboard. Opened out and commenced testing.
10.10	Finished testing. Reported fault, short distance outboard.
10.25	Cast Weston end off drum, and made it fast to windlass. Waterville end taken to drum, and commenced heaving it in.
10.35	Broken end inboard. Ind.=38 revs.=·109 N.M. Picked up=*piece "A."*
11.0	Preparing to buoy Weston end.
11.20	Streamed buoy, and let go moorings with Weston end attached. Buoy's Moorings=Buoy No. 43, "H" flag, 2 Miller's Globes, 50 fms. $\frac{5}{8}$" chain, 10 fms. stray $\frac{5}{8}$" chain, mushroom=4 cwt. 1 qr. 6 lbs. Position of Buoy { Lat. 51° 10′·85 N. Lon. 5° 20′·85 W.
11.25	Set on for new grappling position.

HOUR.	TUESDAY, JANUARY 14th (4th DAY OUT)—*Contd.*
P.M.	
	DRAG No. 4.
11.50	In position. Lowered ordinary long prong grapnel, with 20 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 6 rope.
11.57	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
MID.	Mod. WNW breeze. Fine clear weather. Bar. 30·84. Ther. 62°.
	WEDNESDAY, JANUARY 15th (5th DAY OUT).
A.M.	
0.35	Strain = 30 cwt. (normal). Commenced picking up.
0.50	Grapnel at bows. No sign of cable. Set on for new position.
	DRAG No. 5.
1.3	In position. Lowered same grapnel with 20 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 6 rope.
1.8	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
1.30	Average strain = 20 cwt.
2.0	,, ,, = 18 cwt.
2.7	Commenced picking up.
2.19	Grapnel at bows. No sign of cable. Set on for new position.
	DRAG No. 6.
2.30	In position. Lowered same grapnel with 20 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 6 rope.
3.0	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
3.45	Average strain = 18 cwt.
4.0	Moderate WNW wind. Fine clear weather. Bar. 31·20. Ther. 57°.

HOUR.	WEDNESDAY, JANUARY 15th (5th DAY OUT)—*Contd.*
A.M. 4.20	Strain = 18 cwt. Commenced picking up.
4.25	Grapnel at bows. No sign of cable. Unshackled ordinary grapnel and shackled on ordinary centipede.
	DRAG No. 7.
4.40	In position. Lowered centipede grapnel with $2\frac{1}{2}$ fms. $\frac{3}{4}$" trail chain and 20 fms. $\frac{3}{4}$" chain, and commenced paying-out 4×6 rope.
4.50	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
6.0	Average strain = 18 cwt.
7.30	,, = 18 cwt. Commenced picking up.
7.45	Grapnel at bows. No sign of cable. Set on for new position. Took centipede grapnel off and shackled on ordinary long prong grapnel.
8.0	Similar wind and weather. Bar. 31·10. Ther. 53°.
	DRAG No. 8.
8.5	In position. Lowered ordinary long prong grapnel with 20 fms. $\frac{3}{4}$" chain, and commenced paying out 4×6 rope.
8.10	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
9.0	Strain suddenly rose to 100 cwt. and fell again.
9.30	Strain rising. Commenced to pick up.
9.45	Grapnel at bows. No sign of cable. Set on for new position.
	DRAG No. 9.
10.5	In position. Lowered same grapnel with 20 fms. $\frac{3}{4}$" chain, and commenced paying out 4×6 rope.
10.10	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
10.20	Strain commenced to rise steadily. Stopped ship.

HOUR.	WEDNESDAY, JANUARY 15th (5th DAY OUT)—*Contd.*
A.M. 10.25	Strain=25 cwt. Steady. Commenced picking up.
10.30	Grapnel at bows. No sign of cable. Set on for new position.
	DRAG No. 10.
10.40	In position. Lowered same grapnel with 20 fms. $\frac{3}{4}$" chain, and commenced paying out 4×6 rope.
10.45	Paid out to 100 fms. of rope and chain. Engines slow=17 revs.
11.30	Average strain=18 cwt.
NOON.	,, =18 cwt.
	Moderate NW wind. Clear weather.
	Bar. 30·68. Ther. 57°.
	Position by observation { Lat. 51° 12′·0 N. Lon. 5° 16′·0 W.
P.M. 1.0	Average strain=18-20 cwt.
1.20	Strain suddenly rose to 50 cwt. and fell again to 18.
1.45	Average strain=18 cwt.
2.10	,, =18 cwt. Commenced picking up.
2.20	Grapnel at bows. No sign of cable. Set on for new position.
	DRAG No. 11.
3.0	In position. Lowered same grapnel with 20 fms. $\frac{3}{4}$" chain, and commenced paying out 4×6 rope.
3.8	Paid out to 100 fms. of rope and chain. Engines slow=17 revs.
3.10	Strain suddenly rose to 100 cwt. Stopped ship and strain fell. Slow ahead again. Strain rose again to 140 cwt.
3.15	Commenced picking up.
3.23	Picking up strain=100 cwt.
3.30	Grapnel at bows with cable, Siemens' L.I. twin core, No. 8553. Set about bending on seizing chains of drum ropes.
3.40	Cut cable and veered away on Starboard rope.

HOUR. P.M.	WEDNESDAY, JANUARY 15th (5th DAY OUT)—*Contd.*
3.52	Took Port rope on Waterville end to drum, and started heaving in.
3.55	End of cable abaft drum. *Cut 24 fms. off damaged end.*
4.0	Light NW'ly breeze, and fine clear weather. Bar. 30·70. Ther. 56°. Commenced testing.
4.35	Finished testing. Cable faulty towards Waterville.
4.40	Lowered cable cutter and sent her away to put fresh lamps on cable buoy "H," about 3 N.M. distant.
4.45	Took Waterville end off drum and made it fast to stoppers. Took short end to drum, set Indicator at zero, and commenced heaving in. Strain = 100 cwt.
5.0	Found it impossible to heave loose piece on board while holding on to Waterville end.

BUOYING WATERVILLE END AND PICKING UP LOOSE PIECE.

8.0	Holding on everything. Awaiting boat's return. Light variable winds. Clear weather. Bar. 30·70. Ther. 54°.
9.5	Observed boat, after having lit buoy, being carried to leeward by tide, so instead of picking up towards Waterville decided to buoy that end and pick up short end towards Weston buoy, and go to boat's assistance.
9.30	Bent moorings on to Waterville end and commenced paying out same.
9.55	Moorings all paid out. Streamed buoy "S" and let go forward. Position of Buoy "S" { Lat. 51° 11′·4 N. Lon. 5° 17′·8 W.
10.24	Resumed heaving in on loose piece, coiling cable in fore tank. Sighted boat on Port bow.
10.55	Broken end passed over drum. Indicator = 166 revs. = 0·477 N.M. = Piece "B." Set on to pick up boat.

HOUR.	WEDNESDAY, JANUARY 15th (5th DAY OUT)—*Contd.*
P.M.	
11.10	Came up to boat and hoisted same. Finished for night. Set on to lie-to near cable buoys.
MID.	Light variable airs and calms. Fine clear weather. Bar. 30·72. Ther. 53°.
	THURSDAY, JANUARY 16th (6th DAY OUT).
A.M.	
4.0	Calm and clear weather. Bar. 30·72. Ther. 56°.
6.0	Preparing to pick up buoy on Waterville end. Similar weather. Bar. 30·60. Ther. 53°.
8.15	Lowered cable cutter and towed her to buoy.
8.45	Up to buoy. Sent cutter away with drum rope.
9.0	Commenced heaving in moorings of buoy.
9.8	Waterville end of cable on drum. Set Indicator 0. *Cut 2 fms. off* (damaged). Coiling cable in fore tank.
9.15	Hove up buoy and boat.
9.40	0·50 N.M. of cable picked up. Cable in good condition. Picking up strain = 25 cwt.
10.14	1·00 N.M. of cable picked up. Cable in good condition. Picking up strain = 18 cwt.
10.20	Broken end passed over drum. Indicator = 371 revs. = 1·066 N.M. = Piece "C." 4 fms. of this end was badly flattened out.
	GRAPPLING FOR WATERVILLE END OF CABLE (2nd TIME).
10.25	Let go a paint drum with rope and sounding sinkers to mark position where end came on board. Position { Lat. 51° 11′·1 N. Lon. 5° 19′·5 W.
10.30	Set on for grappling position.

HOUR.	THURSDAY, JANUARY 16th (6th DAY OUT)—*Contd*
A.M.	
	DRAG No. 12.
10.40	In position. Lowered ordinary long prong grapnel with 10 fms. $\frac{7}{8}$" chain, and commenced paying-out 4 × 6 rope.
10.45	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
10.50	Strain steadily rose to 40 cwt. and fell again suddenly to 18 cwt.
11.0	Strain suddenly rose to 25 cwt. Commenced picking up.
11.5	Grapnel at bows. No sign of cable. Set on to light up cable buoy "H."
11.25	Up to buoy. Lowered cable cutter and sent her away to put fresh lamps on buoy.
11.40	Boat returned to ship and was hoisted up. Set on for new position to grapple.
NOON.	Calm, fine clear weather. Smooth sea. Bar. 30·58. Ther. 57°.
	DRAG No. 13.
P.M.	
0.15	In position. Lowered same grapnel with 10 fms. $\frac{7}{8}$" chain, and commenced paying out 4 × 6 rope.
0.30	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
0.45	Strain = 18 cwt.
1.0	,, = 20 cwt.
1.30	Average strain = 18 cwt.
1.55	Strain steadily rose to 30 cwt. Stopped ship and commenced to pick up.
2.7	Grapnel at bows. No sign of cable. Set on for new position.
	DRAG No. 14.
2.25	In position. Lowered same grapnel with 10 fms. $\frac{7}{8}$" chain, and commenced paying out 4 × 6 rope.

HOUR.	THURSDAY, JANUARY 16th (6th DAY OUT)—*Contd.*
P.M.	
2.30	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
3.0	Strain = 20 cwt.
3.15	,, = 18 cwt.
3.25	,, rose to 30 cwt. Slow astern, and commenced to pick up. 32 fms. out strain fell to 0.
3.35	Grapnel at bows. No sign of cable. Set on for new position.
	DRAG No. 15.
3.42	In position. Lowered same grapnel with 10 fms. $\frac{7}{8}$" chain, and commenced paying out 4 × 6 rope.
3.45	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
3.47	Sounded in 36 fms. (Thompson's Tube).
4.0	No strain. Calm and clear. Bar. 30·40. Ther 60°.
4.15	Strain = 10 cwt.
4.30	No strain.
4.35	,, ,, Commenced picking up.
4.40	Grapnel at bows. No sign of cable. Set on for new position.
4.42	Sounded in 35 fms. (Thomson's Tube).
	DRAG No. 16.
4.45	In position. Lowered same grapnel with 10 fms. $\frac{7}{8}$" chain, and commenced paying out 4 × 6 rope.
4.58	Paid out to 100 fms. of rope and chain. Engines slow = 17 revs.
5.15	No strain.
5.30	Strain = 10 cwt.
5.42	,, steadily rose to 20 cwt. Stopped ship and commenced picking up.

HOUR. P.M.	THURSDAY, JANUARY 16th (6th DAY OUT)—*Contd.*
5.47	36 fathoms out. Strain suddenly fell to 0.
5.50	Grapnel at bows. No sign of cable. Set on for new position. Unshackled ordinary grapnel, and shackled on Cole's Centipede, with $2\frac{1}{2}$ fms. $\frac{3}{4}$" trail chain. Ran to Cable Buoy and back to check distance off.
	DRAG No. 17.
6.40	In position. Lowered "Centipede" with 10 fms. $\frac{7}{8}$ chain, and commenced paying out 4×6 rope.
6.45	Paid out to 100 fms. of rope and chain. Engines slow= 17 revs.
7.15	No strain.
7.40	,, ,, Commenced picking up.
7.48	Grapnel at bows. No sign of cable. Set on for new position.
8.0	Light ENE wind and clear. Bar. 30·70. Ther. 56°.
	DRAG No. 18.
8.15	In position. Lowered same grapnel with 10 fms. $\frac{7}{8}$" chain, and commenced paying out 4×6 rope.
8.5	Paid out to 100 fms. of rope and chain. Engines slow= 17 revs.
8.15	No strain.
8.42	Strain suddenly rose to 140 cwt. Stopped ship and paid out a few fathoms.
8.45	Commenced picking up. Strain=100 cwt.
8.50	Picking up very slowly. Average strain=80 cwt.
9.0	,, ,, ,, ,, ,, =100 cwt.
9.10	Grapnel at bows with cable, Siemen's type L.I., No. 8553. Strain=120 cwt. Bent on seizing chains of drum ropes.

HOUR.	THURSDAY, JANUARY 16th (6th DAY OUT)—*Contd.*
P.M. 9.30	Cut cable. Took grapnel inboard and grappling rope off drum.
9.35	Veered away on port rope (loose piece).
9.40	Took drum rope on Waterville end to drum, and commenced heaving in.
9.50	Enough cable abaft drum for splice. *Cut 1 fm. off*, and commenced testing.
10.50	Got top end of cable from after tank, and commenced opening out for splice with Waterville end.
10.52	Finished testing Waterville end, O.K. Testing tank end.
11.45	Finished testing. Telegram sent to—"Silvergray, London. About to splice on to Waterville end and lay to Weston end. All well. Crawford."
MID.	Light variable airs. Fine clear weather. Bar. 30·72. Ther. 54°.
	FRIDAY, JANUARY 17th (7th DAY OUT).
A.M. 0.20	Commenced joints between Waterville end and cable in after tank. *Cut 8 fms. off* after tank end for this splice.
2.20	Finished joints. Each core brass taped over joint.
2.25	Commenced splice.
3.25	Finished ,,
3.30	Preparing to buoy loose end.
4.0	Calm and clear. Bar. 30·72. Ther. 56°.
4.10	Veered away on drum rope on loose piece to end.
	COMPLETING REPAIRS TO WATERVILLE—WESTON 1885 CABLE.
4.15	Attached end of drum rope on loose piece to Buoy No. 62 and let it go.

HOUR.	FRIDAY, JANUARY 17th (7th DAY OUT).—*Contd.*
A.M.	
4.17	Commenced paying out cable from after tank towards buoy on Weston end. Engines=slow.
4.18	Put engine out of gear. Brakes checking. Ind.=0. Splice on drum. Position of splice {Lat. 51° 10′·85. N. / Long. 5° 20′·85. W.
4.24	Ind.=87 revs.=0·250 N.M. paid out. Strain=10 cwt. Engines=19 revs.
4.30	Ind.=174 revs.=0·500 N.M. paid out. Strain=10 cwt. Engines=19 revs.
4.38	Ind.=261 revs.=0·750 N.M. paid out. Strain=15 cwt. Engines=19 revs.
4.45	Ind.=348 revs.=1·000 N.M. paid out. Strain=15 cwt. Engines=19 revs.
4.52	Ind.=435 revs.=1·250 N.M. paid out. Strain=15 cwt. Engines=19 revs.
4.59	Ind.=522 revs.=1·500 N.M. paid out. Strain=15 cwt. Engines=19 revs.
5.6	Ind.=609 revs.=1·750 N.M. paid out. Strain=15 cwt. Engines=19 revs.
5.13	Ind.=696 revs.=2·000 N.M. paid out. Strain=15 cwt. Engines=19 revs.
5.20	Ind.=783 revs.=2·250 N.M. paid out. Strain=15 cwt. Engines=19 revs.
5.27	Ind.=870 revs.=2·500 N.M. paid out. Strain=15 cwt. Engines=19 revs.
5.33	Approaching buoy on Weston end of cable. Lowered boat. Put brakes down and engine in gear.
5.40	Sent boat with drum rope to buoy "H" on Weston end.
5.45	Commenced heaving in on drum rope.
5.52	Cleared buoy from moorings, and hoisted up buoy and boat.
6.8	Took cable off drum. Ind.=908 revs.=2·610 N.M.

HOUR.	FRIDAY, JANUARY 17th (7th DAY OUT)—*Contd.*
A.M. 6.10	Took buoy's moorings to drum, and commenced picking up on same.
6.15	Veered away on cable (Waterville end).
6.40	Weston end of cable on drum.
6.45	Enough cable abaft drum for splice. Commenced testing.
7.0	Commenced opening out ends ready for *final splice*. *Cut 8 fms. off tank end* (Waterville end).
8.0	Calm and clear. Bar. 30·60. Ther. 55°.
8.20	Telegram sent to—"Graysilver & Silvergray, London. About to make final splice. Expect to sail for London direct this evening. All well. Crawford."

MAKING AND SLIPPING FINAL SPLICE.

9.40	Finished testing. Commenced joints.
11.10	Finished joints. (Each core brass taped over joint.)
11.15	Commenced splice. Sounding No. 3T in 41 fms. n. sn Bottom. Temp.—min. 49°·2 F., max. 51°
NOON.	Light variable wind and clear. Bar. 30·62. Ther. 55°.
P.M. 0.5	Finished splice.
0.8	Bent slip ropes on to cable and commenced veering away on same.
0.15	Bent slip stopper on to bight of cable.
0.20	Slipped final bight. Set on for mark buoy "P." Position of final splice { Lat. 51° 11′·5 N. / Lon. 5° 17′·0 W. Total length of new cable laid in by Ind.=2·621 N.M.=8 fms. for splices=2·613 N.M. Total length of new cable now in after-tank=2·010 N.M.
0.40	Up to buoy. Lowered cutter, and sent her with drum rope to dismantle buoy.

HOUR. P.M.	FRIDAY, JANUARY 17th (7th DAY OUT)—*Contd.*
0.45	Slipped buoy from moorings, and commenced picking up moorings.
0.50	Hoisted up buoy and boat.
1.10	All buoy's moorings on board. Set on for buoy on short piece of cable.
2.20	Up to buoy. Lowered boat and sent her with drum rope to buoy.
2.25	Slipped buoy from moorings and commenced heaving in on drum rope.
2.45	Hoisted up buoy and boat.
2.50	End of loose piece of cable on drum set Ind. 0.
3.15	0·50 N.M. of cable picked up. Cable in good condition.
3.45	Broken end in board and on drum Ind. = 294 revs. = *0·845 n.m.* Piece "D." About 50 fms. from end cable showed signs of having been hooked previously.
3.50	Set on for London. On starting the engines it was found that something was foul of the propeller. On inspection the paint drum put down Friday morning was found to be jammed between the blades of propeller and the stern post.
3.57	Lowered boat and cleared propeller.
4.0	Calm and overcast. Bar. 30·40. Ther. 50°.
4.38	Hoisted boat and set on again.
8.0	Calm and overcast. Bar. 30·40. Ther. 60°.
11.55	Longships abeam.
MID.	Calm and clear. Bar. 30·34. Ther. 60°.

HOUR.	STEAMING TO LONDON.
A.M.	SATURDAY, JANUARY 18th (8th DAY OUT).
0.15	Wolf Rock abeam.
2.35	Lizard Lights abeam. Distant, 6·0 N.M.
4.0	Light ENE wind, and overcast. Bar. 30·36. Ther. 58°.
7.10	Eddystone abeam. Distant, 8 N.M.
8.0	Similar wind and weather.
9.55	Start Point abeam. Distance, 3·3 N.M.
NOON	Mod. ENE breeze. Overcast. Bar. 30·33. Ther. 62.
P.M.	
4.0	Light ENE breeze, and misty. Bar. 30·40. Ther. 70.
7.0	St. Catherine's Point abeam. Distance = 7·5 N.M. Cable hands employed during the day clearing up and stowing away cable gear. Mechanics overhauling and dismantling machinery.
8.0	Light ENE breeze. Fine clear weather. Bar. 30·40. Ther. 69°.
MID.	Light ENE breeze, and misty. Bar. 30·35. Ther. 54°.
	SUNDAY, JANUARY 19th (9th DAY OUT).
A.M.	
1.25	Beachy Head. Bearing north true.
2.0	Light breeze, smooth sea, with fog.
2.30	Royal Sovereign abeam.
4.0	Light ENE breeze. Smooth sea. Clearer. Bar. 30·4. Ther. 64° F.
4.40	Weather thick. Slowed engines. Hearing fog trumpet from Varne lightship close by, turned ship round and decided to lie to till fog lifted.
8.0	Misty. Bar. 30·40. Ther. 50° F.

HOUR.	SUNDAY, JANUARY 19th (9th DAY OUT)—*Contd.*
A.M. 8.30	Made the land to westward of Dungeness.
9.30	Weather setting in thicker. Dropped Port anchor and paid out 30 fms. chain. Sounding whistle for pilot.
10.0	Pilot boarded. Weighed anchor and proceeded slow. Weather clearing.
11.15	Weather clearing. Set on full speed.
NOON.	Light ENE breeze. Misty. Bar. 30·40. Ther. 50°.
P.M. 0.45	Dover abeam.
2.50	North Foreland abeam.
4.0	Passed Prince's Channel Lightship.
4.35	Passed Girdler Lightship.
5.30	Passed Nore Lightship.
6.0	Mod. NW breeze. Fine and misty.
7.0	Off Gravesend. Channel pilot left, and river pilot (Twist) came on board. Mr. Gott left for shore.
9.0	Off Silvertown Works. Ship preparing to make fast to "Dacia," inside berth.
9.30	Ship all fast. All cable hands left ship. Draught { Fore = 11′ 6″ / Aft = 12′ 0″ } Mean = 11′ 9″.
	MONDAY, JANUARY 20th.
1.0	Finished with all hands.
3.0	Crew signed off Articles.

COMMERCIAL CABLE COMPANY'S CHARTER.

BRISTOL CHANNEL REPAIRS,

JANUARY, 1902.

S. S. "BUCCANEER."

DISTRIBUTION OF WEIGHT IN SHIP ON ARRIVAL IN LONDON AFTER COMPLETION OF REPAIR.

	Tons.
Cable in fore tank (picked-up cable)	8·539
,, ,, (New)	6·872
Coal in bunkers	165·000
Fresh water in after fresh water tank	13·000
Fresh water in fore cone	2·000
Fresh water in side tanks	—
Water in ballast tanks—forward	75·000
,, ,, aft	8·000
Boatswain's stores forward	2·000
Carpenter's ,, ...	·300
Cable stores and buoys	10·000
Engine room stores	3·000
Water in main boilers	30·000
Steward's stores	2·500
Extra chain cable	1·000
Spare anchors and ropes	2·000
,, propeller	3·000
Deck machinery	10·000
Total ...	342·211

Draught of ship { Fore 11′ 6″ / Aft 12′ 0″ } mean 11′ 0″.

January 20th, 1902.

DISTRIBUTION OF CABLE IN SHIP ON ARRIVAL IN LONDON AFTER COMPLETION OF REPAIR.

FORE TANK.

Piece.	Type.	Siemens' Factory No.	Length. N.M.	Weight. Tons.
D	L.I.	8553	0·845	2·890
C	„	„	1·066	3·646
B	„	„	0·477	1·632
A	„	„	0·109	0·371
		TOTAL =	2·497	8·539

AFTER TANK.

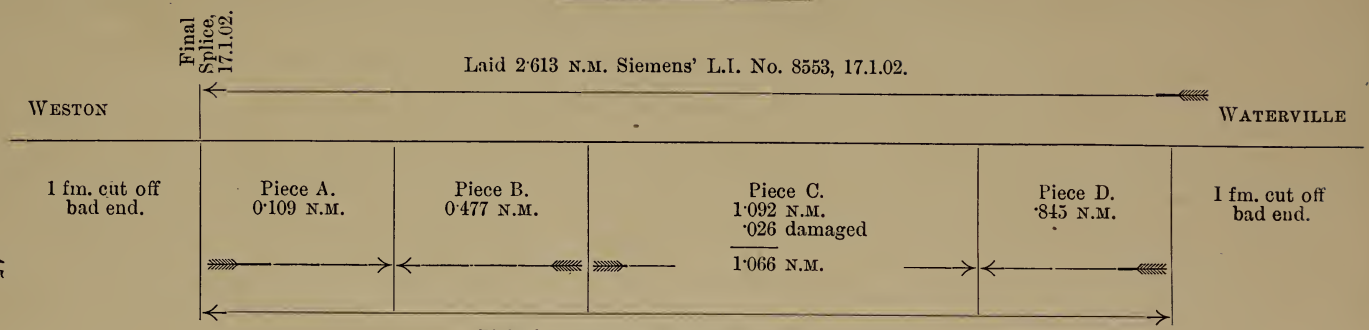
Type.	Siemens' Factory No.	Length. N.M.	Weight. Tons.
L.I.	8553	2·010	6·872

SUMMARY.

	N.M.	TONS.
Fore Tank, Picked-up Cable	=2·497=	8·539
After Tank, New Cable	=2·010=	6·872
TOTAL=	4·507=	15·411

January, 1902.

EXPENDITURE OF CABLE AND PICKED-UP PIECES.



New Cable Laid	=	2·613	N.M.	
Cable Picked-up	=	2·523	,,	
		0·090	,,	
Cut off Ends	=	0·002	,,	
Excess of Laid over Picked-up	=	0·088	N.M.	

4·639 N.M. taken out in ship, — 2·613 N.M. laid in Section = 2·026 N.M. less ·016 N.M, for splices = 2·010 N.M. of New Cable L.I. No. 8553 left in After Tank. The 2·523 N.M. Cable is mechanically and electrically good, and will be spliced on to New Cable in After Tank.

January, 1902.

COMMERCIAL CABLE COMPANY'S CHARTER.

BRISTOL CHANNEL REPAIRS, 1902.

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COMMERCIAL CABLE COMPANY'S CHARTER.

BRISTOL CHANNEL REPAIRS, 1902.

ELECTRICAL REPORT.

January 24th, 1902.

F. C. Crawford, Esq.,
Engineer in Charge,
S.S. "Buccaneer."

Dear Sir,

Herewith I beg to hand you a summary of the Electrical work during the recent Repair to the Commercial Cable Company's Weston—Waterville (1885) Twin Core Cable.

Leaving the Silvertown Works at 11.45 a.m. on January 11th, the "Buccaneer" had a smooth-water passage down Channel, and at 1 p.m. on January 13th, signalled off Lundy Island, and, after taking a Bristol Channel pilot on board, anchored in Bideford Roads (Barnstaple Bay) at 3.45 p.m. the same day, there to await the arrival of Mr. J. Gott, the representative of the Commercial Cable Co.

At 9.35 a.m. the following day, January 14th, Mr. J. Gott joined the "Buccaneer," and at 9.50 a.m. ship weighed anchor and set on for position of fault, some 23 miles W of Lundy Island. On arrival on board Mr. Gott informed me that the resistance from Weston to the break in "Rib" core was 1167, which, assuming the mean temperature of the laid section to be 49° F., the actual observed temperature at position of final splice being 49·2° F., placed the fault at 91·7 N.M. approximate (core length) from Weston. Before starting work it was arranged that the testing room should keep Greenwich time—as both Weston and Waterville worked to this—in order to avoid confusion in arranging times for watching,

etc. The engineering log was kept at ship's time. Consequently a difference of about half an hour will be noticed in the times recorded for the different operations.

At 2.55 p.m., January 14th, a mark buoy was slipped, and at 3.30 p.m. the grapnel was lowered for the first drag. At 7.56 p.m. the cable was hooked at the third drag, and at 9 p.m. the Weston end was handed to testing room. Weston was called on Morse, and answered immediately. The "Plain" and "Rib" cores were looped at Weston station, and a C.R. test taken from the ship with the following result:

C.R. of looped cores corrected for temperature of B.C. and leads deducted = 2329·45 Ω.

C.R. of "Plain" core = 1165·35 Ω. C.R. of "Rib" core = 1164·10 Ω.

This resistance represented a length of 91·515 N.M. in circuit (core) between ship and shore, which has been taken as the correct position of the cut in.

Weston "free'd" both "Plain" and "Rib" cores alternately, and tests were taken from ship for D.R., using 20 cells Leclanché—30 volts approximate. The following results were obtained:

WESTON END.—Length in circuit, each core = 91·515 N.M.

"Plain" core 1st min. zinc. Total D.R. = 93·93 Ω = *10822· Ω per N.M.

"Rib" " " " " " = 65·75 Ω = 6017 Ω per N.M.

(*For full tests see Appendix.*)

The tests having shown that the cable to Weston was O.K., attention was now paid to Waterville. On connecting "Plain" core to Morse, there were unmistakable signs of "dead earth" close to ship, and the result was the same when "Rib" was connected. Localisation tests were taken by Cann's and Rymer-Jones' methods, which placed the fault within a quarter of a mile of ship, of which fact you were informed at the time. At 10.52 p.m.,

*Probably much too high.

January 14th, we started picking up cable towards fault on Waterville side, and at 11 p.m. the broken end came inboard. The length picked up by Indicator=0·1092 N.M.

This piece was labelled "A" top and bottom and coiled in fore-tank.

Character of Fault: Complete break, and from appearances one sheating wire only had been holding, which had parted under the strain of picking up.

"Plain" core $\frac{1}{2}$" of copper exposed, the copper being bright and clean, evidently a fresh break.

*"Rib" core had barely $\frac{1}{8}$" of conductor exposed which was very dirty and oxydised. Carbon current had evidently been used on this end when testing from shore.

At 11.52 p.m., January 14th Weston end was buoyed. Buoy No. 43, "H" flag, and two lighter lamps affixed, and at 0.22 a.m., January 15th, the grapnel was again lowered to drag for Waterville end. Grappling was carried on all through the night, and at 3.45 p.m., 15th, cable was hooked at the 11th drag. At 4 p.m., cable at bows. Cut cable at 4.8 p.m., veered away at loose end and started picking up on Waterville end. Cut 24 fathoms=0·024 N.M. off Waterville end for damaged places before Indicator was set. 4.30 p.m., Waterville end in Testing Room and the shore was called up first on "Plain" and then on "Rib" cores but no response was received. From indications on speaking instrument, "earth" on both cores a short distance from ship. Localisation tests were immediately taken, Rymer-Jones' modification of Cann's test being used, and the break was placed at 1·03 N.M. approximate from ship. During these tests, the cable cutter was sent away to renew lamps on cable buoy Weston end. Some delay was caused at this time owing to the cable cutter—sent away at 4.40 p.m.—not having returned to ship, owing to strong tide and wind,

* This was the original fault localised from Weston.

and operations were suspended for the time being, awaiting return of same; the ship hanging on to cable during this period. At 9.45 p.m., the cutter being still absent, it was decided to pick up loose end towards Weston buoy, and buoy Waterville end, and go in search of boat. Let go buoy on Waterville end (10.25 p.m.), No. 62, "S" flag, and proceeded to pick up loose end towards break. The end came inboard at 11.25 p.m.

Length picked up=0·477 N.M.

Labelled Piece "*B*" top and bottom, and coiled in fore-tank.

The cable cutter was picked up by the ship at 11.30 p.m, and as cable work had been carried on continuously from 2.55 p.m. on January 14th (some 33 hours) to the present time, it was decided to discontinue work for the night and dodge in vicinity of cable buoys until the morning.

On the following day, January 16th, 9.25 a.m., Waterville end was taken aboard and picking up commenced (coiling down in fore-tank), and at 10.45 a.m. the broken end came in.

Length picked up=371 *revs.*=1·0664 N.M.

Labelled Piece "*C*" top and bottom, and coiled in fore-tank.

Character of Fault: Complete break, and had the appearance of having been damaged by trawler as in original break.

"Plain" core had no conductor exposed at the extreme end, the G.P. having been drawn down over and insulating it, but at between 4″ to 6″ from the break the percha was split in two or three places, exposing the conductor.

"Rib" core had ½″ of copper exposed, quite bright and clean.

At 11 a.m. the same day, set on to take up position to drag for Waterville end, and at 9.10 p.m., Drag 18, the cable was hooked—on Captain Cole's grapnel—strain rising to 7 tons. Started heaving in, strain varying from 2½ to 4 tons, and at 9.40 p.m. cable was at

bows. Waterville end was handed to Testing Room at 10.20 p.m. Called him on Morse and received immediate reply. Waterville was instructed to "free" both cores for ten minutes, and an insulation test taken on each core in turn gave the following results:

D.R. 30 *volts.* *Length in circuit* (*each core*) = 236·9 N.M.

"Plain" core 1st min. zinc. Total = 34·606 Ω = 8198 Ω per N.M.

"Rib" ,, ,, ,, ,, = 25·289 = 5991 ,,

(*For full tests see Appendix.*)

These results proved that the cable to Waterville was electrically perfect.

Called Waterville at 11 p.m., January 16th, and instructed him to loop cores for ship's C.R. test, which was done, and ship obtained the following:

C.R. of loop (corrected) = 5961·2 C.R. { "Plain" core = 2982·17 ω
"Rib" ,, = 2979·03

Length in circuit, each core = 236·9 N.M.

Immediately after these tests the following telegrams were forwarded to Waterville for transmission to London:

"Gott to G.M. and M.E. Thursday evening got Waterville—Weston, O.K. Now going to splice up and pay out to Weston end. Ship has been at work all the time since Monday."

"Silvergray, London. About to splice on to Waterville end and lay to Weston. All well. Crawford."

At 11.40 p.m. (16th), before splicing on to Waterville end the cable in after-tank was tested for C.R. in order to determine length after paying-out a portion towards Weston buoy—and also for D.R. Results were O.K. And at midnignt (16th) the end of cable in after-tank was given out to prepare for splicing at Waterville end. The joints were commenced at 0.50 a.m., January 17th, and finished at 2.50 a.m., all bare core and joints being brass taped. The splice was finished at 3.55 a.m. Buoyed loose end of cable at 4.45 a.m.

(Buoy 62), and paying out towards buoy on Weston cable was commenced at 4.47 a.m. During paying out a control test was kept on cable—insulation being taken with 30 volts—the ends of cores being "free" at Waterville for ten minutes, then speaking and "freeing" again, and this routine was observed until ship was up to buoy on Weston end.

The buoy on Weston end was reached at 6 a.m., and at 7 a.m. Weston end was aboard. At 7.23 a.m. Weston was instructed to loop cores, and ship took C.R. of circuit with the following result:

TEST ON WESTON END.—*Length in circuit, each core* = 91·515 N.M.

C.R. of loop (corrected) = 2325·3 ω. C.R. { "Plain" core = 1163·26 ω. "Rib" ,, = 1162·04.

After the C.R. test towards Weston had been taken both cores were "free'd" at Weston for ten minutes, but the D.R. test being unsatisfactory, it was repeated at 8.25 a.m. with highly satisfactory results. D.R. 30 volts.

"Plain" core 1st min. zinc. Total = 76·0 Ω = 6955 Ω per N.M.

"Rib" core ,, ,, ,, ,, = 63·333 = 5796 ,,

Length in circuit, each core = 91·515 N.M.

(*For full tests see Appendix.*)

At 9 a.m. (17th) the following SG. among others was sent to Weston for transmission: "To M. H. Gray, Graysilver, London, and Silvergray, London. About to make final splice. Expect to sail for London direct this evening. All well. Crawford."

Tests being O.K. to Weston, instructed him to call Waterville at noon, and said good-bye to him; and attention was then paid to Waterville, who was called up and instructed to loop cores for five minutes, and a C.R. test was taken from ship.

C.R. 20 *cells. Waterville end. Length in circuit, each core* = 239·46 N.M.

C. Resistance of loop (corrected) = 6025 ω. C.R. { "Plain" core = 3014·1 ω. "Rib" ,, = 3010·9.

Between 9.5 and 9.20 a.m. (17th) both cores were "free'd" at Waterville for ship's insulation test.

D.R. 30 *volts.*

		Ω	Ω	
"Plain" core	1st min. zinc.	Total = 29·23	= 7000	per N.M.
"Rib"	,, ,, ,, ,, ,,	= 25·333 = 6066		,,

Length in circuit, each core = 239·46 N.M.

(*For full tests see Appendix.*)

The cable being O.K., instructed Waterville to call Weston at noon, and said good-bye to him at 9.20 a.m. (17th), and at 9.50 a.m. commenced joints between Weston and Waterville ends of cable.

The joints were finished, cooled, and brass taped by 11.45 a.m. (17th) and the splice commenced, which was finished at 0.35 p.m. The final splice was slipped at 1 p.m., and ship then set on to pick up mark buoy, which operation was completed at 1.25 p.m., when the hands were sent to dinner. At 3 p.m. the ship was up to buoy No. 62 on loose end of cable, and proceeded to pick up same. The seaward end of cable came inboard at 3.55 p.m.

Length picked up = 0·845 N.M. *Piece "D."*

Character of Break: The cable bore evidence of having broken under strain at a weak place, probably caused by trawler, the grapnel having been working close by. There are indications—for about 50 fms.—of the grapnel surging along cable. The end of "Plain" core was perfectly sealed, the percha being drawn down over conductor and the insulation perfect when tested with 80 volts. The "Rib" core had about ½" of conductor exposed.

Having cleared the cable ground the "Buccaneer" proceeded full speed for London at 5 p.m. January 17th, and after a smooth water passage throughout, being detained by fog off Dungeness about six hours, arrived at Gravesend at 7 p.m., January 19th.

On arrival at Gravesend Mr. Gott received letters enclosing results of tests taken from Weston and Waterville respectively,

after completion of repairs, which he handed to me. These results were highly satisfactory, and copies of which will be found in the appendix.

The "Buccaneer" arrived off the Silvertown Works and moored inside "Dacia" at 9 p.m. the same night.

In the appendix will be found the following Tables, etc. :

Revised Lengths and Factory Values at 75° F. of "Plain" and "Rib" cores.

Tests from Ship towards Weston and Waterville on picking up ends.

Tests from Ship towards Weston and Waterville before making Final splice.

Final Tests from Weston and Waterville after repairs.

Distribution of Cable in Tanks "Buccaneer" and 75° values *before* repair.

Distribution of Cable in Tanks "Buccaneer" and 75° values *after* repair.

Expenditure Table of *New* and *Picked* up Cable.

Notes on Mean Bottom Temperature.

Diagram of Operations During Repairs.

I am, dear Sir,

Yours faithfully,

HERBERT E. CANN,

Electrician.

FACTORY ELECTRICAL VALUES AT 75° FAHR.

OF THE WESTON—WATERVILLE (1885) TWIN CORE CABLE AFTER REPAIR BY S.S. "BUCCANEER," JANUARY 17TH, 1902.

[Not including 0·221 N.M. Waterville Land-line (Core $\frac{90\ Cu.}{85}$).]

"PLAIN" CORE.

Length of Section. N.M.	Length. Total N.M.	C.R. at 75° Fahr.			Capacity.			Remarks.
		Total of Section.	Sum of Totals.	Per N.M. of Section.	Total of Section.	Sum of Totals.	Per N.M. of Section.	
WESTON.								
3·845		52·03		13·54	1·185		0·3082	"Bittern."
14·304	18·149	190·80	242·83	13·342	4·342	5·527	0·3036	
1·022	19·171	13·61	256·44	13·342	0·309	5·836	0·3036	
0·671	19·842	8·95	265·39	13·342	0·203	6·039	0·3036	"Marmion."
3·598	23·440	47·67	313·06	13·25	1·202	7·241	0·334	
1·109	24·549	14·80	327·86	13·342	0·336	7·577	0·3036	
1·089	25·638	14·26	342·12	13·10	0·329	7·906	0·3022	
1·782	27·420	23·77	365·89	13·34	0·539	8·445	0·3025	"Mirror."
5·831	33·251	77·80	443·69	13·34	1·765	10·210	0·3027	
1·561	34·812	27·32	471·01	17·51	0·498	10·708	0·3192	"M.B." Rockport Type.
1·249	36·061	16·63	487·64	13·32	0·377	11·085	0·3019	
0·285	36·346	3·86	491·50	13·55	0·087	11·172	0·3054	"Mirror."
0·630	36·976	8·51	500·01	13·51	0·194	11·366	0·3079	
12·988	49·964	173·38	673·39	13·35	3·930	15·296	0·3027	
8·460	58·424	113·84	787·23	13·46	2·570	17·866	0·3038	
18·524	76·948	245·91	1033·14	13·28	5·580	23·446	0·3013	
14·431	91·379	194·04	1227·18	13·45	4·407	27·853	0·3055	
0·136	91·515	1·80	1228·98	13·222	0·041	27·894	0·2994	
2·623	94·138	34·44	1263·42	13·13	0·867	28·761	0·3304	S.S. "Buccaneer," 17.1.02. Both temperature 49·2° F.
23·515	117·653	310·9	1574·32	13·22	7·040	35·801	0·2994	
63·925	181·578	849·38	2423·70	13·29	19·133	54·934	0·2993	
31·575	213·153	425·45	2849·15	13·48	9·595	64·529	0·3040	
86·660	299·813	1154·08	4003·23	13·32	26·098	90·627	0·3011	
10·841	310·654	143·07	4146·30	13·197	3·259	93·886	0·3046	
0·351	311·005	4·61	4150·91	13·13	0·116	94·002	0·3304	S.S. "Buccaneer," June 16th, 1901.
11·692	322·697	156·31	4307·22	13·37	3·571	97·573	0·3055	
0·340	323·037	4·48	4311·70	13·17	0·113	97·686	0·333	
7·938	330·975	106·13	4417·83	13·37	2·425	100·111	0·3056	
WATERVILLE.								

FACTORY ELECTRICAL VALUES AT 75° FAHR.

OF THE WESTON—WATERVILLE (1885) TWIN CORE CABLE AFTER REPAIR BY S.S. "BUCCANEER," JANUARY 17TH, 1902.

[Not including 0·221 N.M. Waterville Land-line (Core $\frac{90\ Cu}{85\ G.P.}$).]

"RIB" CORE.

Length of Section. N.M.	Length. Total N.M.	C.R. at 75° Fahr.			Capacity.			Remarks.
		Total of Section.	Sum of Totals.	Per N.M. of Section.	Total of Section.	Sum of Totals.	Per N.M. of Section.	
WESTON.								
3·845		51·94		13·51	1·165		0·303	"Bittern."
14·304	18·149	191·00	242·94	13·35	4·248	5·413	0·297	
1·022	19·171	13·64	256·58	13·35	0·303	5·716	0·2966	
0·671	19·842	8·96	265·54	13·35	0·199	5·915	0·2966	"Marmion."
3·598	23·440	47·63	313·17	13·24	1·202	7·117	0·334	
1·109	24·549	14·80	327·98	13·35	0·329	7·446	0·297	
1·089	25·638	14·24	342·22	13·10	0·335	7·781	0·308	
1·782	27·420	23·76	365·98	13·34	0·527	8·308	0·2959	"Mirror."
5·831	33·251	77·84	443·82	13·36	1·725	10·033	0·2959	
1·561	34·812	27·32	471·14	17.5	0·498	10·531	0·3192	"M.B." Rockport Type.
1·249	36·061	16·83	487·97	13·5	0·369	10·900	0·2956	
0·285	36·346	3·85	491·82	13·5	0·086	10·986	0·3018	"Mirror."
0·630	36·976	8·49	500·31	13·5	0·191	11·177	0·3031	
12·988	49·964	173·38	673·69	13·35	3·843	15·020	0·296	
8·460	58·424	114·71	788·40	13·56	2·527	17·547	0·2987	
18·524	76·948	245·56	1033·96	13·26	5·529	23·076	0·2986	
14·431	91·379	195·19	1229·15	13·52	4·380	27·456	0·3036	
0·136	91·515	1·80	1230·95	13·267	0·040	27·496	0·2956	
2·623	94·138	34·47	1265·42	13·14	0·863	28·359	0·3291	S.S. "Buccaneer," 17.1.02. Both temperature 49·2° F.
23·515	117·653	311·97	1577·39	13·267	6·950	35·309	0·2956	
63·925	181·578	847·69	2425·08	13·26	18·854	54·163	0·295	
31·575	213·153	421·04	2846·12	13·33	9·565	63·728	0·303	
86·660	299·813	1153·23	3999·35	13·30	25·724	89·452	0·2969	
10·841	310·654	142·92	4142·27	13·18	3·209	92·661	0·2960	
0·351	311·005	4·61	4146·88	13·14	0·116	92·777	0·3291	S.S. "Buccaneer," June 16th, 1901.
11·692	322·697	155·92	4302·80	13·338	3·468	96·245	0·2966	
0·340	323·037	4·48	4307·28	13·17	0·113	96·358	0·3330	
7·938	330·975	105·80	4413·08	13·338	2·354	98·712	0·2966	
WATERVILLE.								

TESTS *from Ship towards* WESTON (*on picking up Weston end,* 14/1/02). *Length in circuit* = 91·515 N.M.

CORES LOOPED AT WESTON.

JANUARY 14TH, 9—9.30 P.M.

C.R. 20 cells. Z. C. Leads = 0·55 ω. Temperature B.C. = 60° F., correct at 60° F. Platinoid.

2330 2330
2330 2330
2330 2330

"Plain" Core = 1165·35 ω = 12·733 per N.M.

2330 − 0·55 ω = 2329·45 "Rib" Core = 1164·10 ω = 12·720 „

C.R. of loop. (Mean C.R. per Kt. 12·727 ω.)

This resistance (at 49° F.) represents a length of 91·515 N.M. in circuit between Ship and Shore.

CORES "FREE" AT WESTON.

D.R. TEST (30 volts).

"PLAIN" CORE.

Mins. Zinc. Lead = nil S.R. 10000.
1 = 7 S.R. 10000 m.p. = 1.
2 = 6 Const. 30 volts through 10^5 = 263 S.R. 400.
3 = 5½ Q = 657·5 through 1 Ω E.C.'s variable.

D.R. total = 93·93 Ω = * 10822 Ω per N.M. at sea temperature.

"RIB" CORE.

Mins. Zinc.
1 = 10 S.R. 10000 m.p. = 1
2 = 9
3 = 8½

D.R. total = 65·75 Ω = 6017 Ω per N.M.

* Resistance approximate, only probably much too high.

TESTS *from Ship towards* WATERVILLE (*on recovering Waterville end,* 16/1/02). *Length* = 236·9 N.M. (*approx.*).

CORES LOOPED AT WATERVILLE.

JANUARY 16TH, 10.30—11.15 P.M.

C.R. (30 volts). Z. C. Leads = 0·55 ω. Temperature B.C. = 62° F., correct at 60° F. Platinoid.

5960 5960
5960 5960
5960 5860

C.R. of loop—leads deducted and corrected for temperature B.C. = 5961·2 ω.

Plain Core, total = 2982·17 ω = 12·588 per N.M.

Rib Core, total = 2979·03 ω = 12·575 per N.M.

CORES "FREE" AT WATERVILLE.

D.R. TEST (30 volts).

"PLAIN" CORE.

Mins. Zinc. Lead=nil S.R. 10000.

1 = 19 S.R. 10000 m.p.=1
2 = 15
3 = 14 Φ=657·5 through 1 Ω
4 = 13
5 = 12½ zero—2

D.R. total=34·606=8198 per N.M. at sea temperature. Ω Ω

"RIB" CORE.

Mins. Zinc.

1 = 26 S.R. 10000 m.p.=1
2 = 22
3 = 21
4 = 20
5 = 19 zero O.K.

D.R. total=25·289=5991 per N.M. at sea temperature. Ω Ω

Galvanometer No. 222 used for D.R. tests.

FINAL TESTS *from Ship on* WESTON *and* WATERVILLE *ends before making final splice*, 17/1/02.

WESTON END.

CORES LOOPED AT WESTON.

JANUARY 17TH, 7.30 A.M. LENGTH EACH CORE = 91·515 N.M.

C.R. (30 volts). Z. C. Leads=0·55 ω. Temperature B.C.=63° F., correct at 60° F. Platinoid.

2325 2325
2325 2325
2325 2325

C.R. of loop corrected for temperature B.C. and leads deducted=2325·3 ω.

C.R. Plain Core, total=1163·26=12·712 per N.M. ω ω

C.R. Rib Core, total=1162·04=12·698 per N.M. ω ω

CORES "FREE" AT WESTON.

D.R. (30 volts). L.=91·515 N.M.

8.30 A.M. "PLAIN" CORE.

Mins. Zinc. Lead=nil S.R. 10000.

1 = 5 S.R. 10000 m.p.=1
2 = 4½ Const. 30 volts through 10^5
3 = 4 =190 S.R. 500
=380 through 1 Ω

D.R. total=76·0=6955 per N.M. at sea temperature. Ω Ω

"RIB" CORE.

Mins. Zinc. Lead=nil S.R. 10000.

1 = 6 S.R. 10000 m.p.=1
2 = 5½
3 = 5½

D.R. total=63·33=5796 per N.M. at sea temperature. Ω Ω

WATERVILLE END.

CORES LOOPED AT WATERVILLE.

JANUARY 17TH, 8.50 A.M. LENGTH EACH CORE=239·46 N.M.

C.R. (30 volts). Z. C. Leads=0·55 ω. Temperature B.C.=64° F., corrected at 60° F. Platinoid.

6022 6022
6022 6022

C.R. of loop corrected for temperature B.C. and leads deducted=6025 ω.

C.R. "Plain" Core, total=3014·1 ω=12·587 ω per N.M.

C.R. "Rib" Core, total=3010·9 ω=12·574 ω per N.M.

CORES "FREE" AT WATERVILLE.

D.R. (30 volts). L.=239·46 N.M.

9.20 A.M. "PLAIN" CORE.

Mins. Zinc. Lead=nil S.R. 10000.

1 = 13 S.R. 10000 m.p.=1. Ω

2 = 11 Φ=380 through 1

3 = 10

D.R. total=29·23 Ω=7000 Ω per N.M. at sea temperature.

"RIB" CORE.

Mins. Zinc. Lead=nil S.R. 10000.

1 = 15 S.R. 10000 m.p.=1

2 = 11

3 = 10

D.R. total=25·333 Ω=6066 Ω per N.M. at sea temperature.

Galvanometer No. 65 used for these tests.

WESTON—WATERVILLE (1885) CABLE.

Bristol Channel Repairs, January 17th, 1902.

FINAL TESTS AFTER REPAIRS.

WESTON-SUPER-MARE, January 17th, 1902. (C.R. not taken. Cores required for traffic.)

D.R. 30 volts.

"PLAIN" CORE.

Z. to Core.	Total. Ω	Per N.M. Ω	C. to Core.	Total. Ω	Per N.M. Ω
Mean of 1st min.	=21·51	7106·	Mean of 1st min.	=25·71	8493·
„ 2nd „	=24·54	8107·	„ 2nd „	=22·22	7340·
„ 3rd „	=27·41	9054·	„ 3rd „	=26 86	8874·
„ 4th „	=28 57	9437·	„ 4th „	=27·34	9031·
„ 5th „	=30·16	9964·	„ 5th „	=30·33	10210·
Mean of all	=26·68	8815·	Mean of all	=26·68	8682·

Cable discharged for 5 mins. between Z. and C. Test. Earth currents variable.

"RIB" CORE.

Z. to Core.	Total. Ω	Per N.M. Ω	C. to Core.	Total. Ω	Per N.M. Ω
Mean of 1st min.	=19·88	6569·	Mean of 1st min.	=22·50	7432·
„ 2nd „	=22·40	7401·	„ 2nd „	=21·31	7039·
„ 3rd „	=24·00	7927·	„ 3rd „	=21·32	7044·
„ 4th „	=25·59	8453·	„ 4th „	=21·86	7221·
„ 5th „	=27·34	9031·	„ 5th „	=22·88	7557·
Mean of all	=24·24	8009·	Mean of all	=21·93	7243·

Cable discharged for 5 mins. between Z. and C. Test. Earth currents variable.

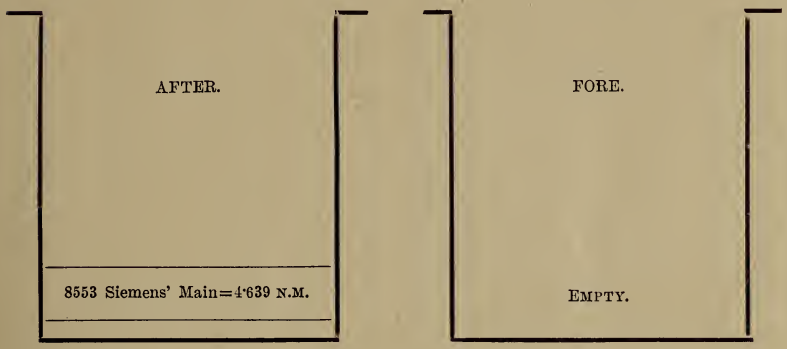
Waterville, January 17th, 1902. 10th min.

			Ω	
Insulation (30 volts)	"Plain" Core	Z.=	10700·	per N.M.
„	„	C.=	9790·	„
			Ω	
„	"Rib" Core	Z.=	10260·	„
„	„	C.=	8540·	„

C.R. { "Plain"=4190· ohms.
"Rib" =4184· ohms.

WESTON—WATERVILLE (1885) REPAIRS.

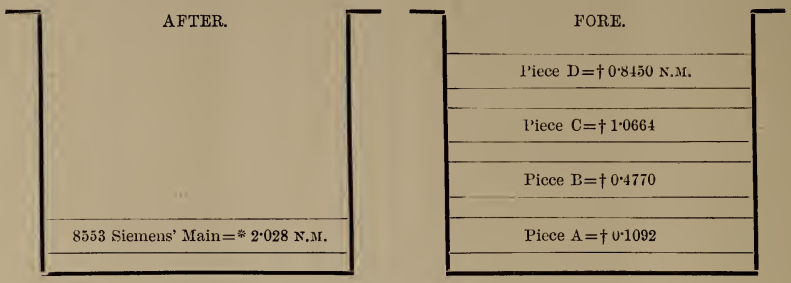
Distribution of Cable in Tanks on board S.S. "Buccaneer" on Leaving the Thames, January 11th, 1902.



Factory Electrical Values at 75° Fahr. of Cable on board S.S. "Buccaneer" on Leaving the Thames, January 11th, 1902.

Type.	No. of Wire.	Length, N.M.		C.R. at 75° Fahr.		Capacity.		D.R. at 75° Fahr.	
		Cable.	Core.	Total per N.M.		Total per N.M.		Total per N.M.	
				ω		mfds.		Ω	
	1			61·580	13·13	1·5496	0·3304	509·6	2390·
8553	2	4·639	4·690	61·627	13·14	1·5435	0·32·1	625·8	2935·

Distribution of Cable in Tanks on Board S.S. "Buccaneer" on her Return to the Works, January 19th, 1902.



* Electrical length determined by C.R. † Indicator lengths.

Factory Electrical Values of Cable on Board S.S. "Buccaneer" on her Return to the Works, January 19th, 1902.

Type.	No. of Wire.	Length, N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Corc.	Total.	Per N.M.	Total.	Per N.M.	Total.	Per N.M.	
				Ω		fmds.		Ω		
				AFTER TANK.						
	1			26·916	13·13	·6773	0·3304	1166·	2390·	
8553		2·028	2·050							
	2			26·937	13·14	·6747	0·3291	14·32	2935·	
				FORE TANK.						
	Plain			11·294	13·22	0·2559	0·2995	—	—	Top in Tank.
Piece D		0·8450	0·8543							Picked up, 17.1.02.
	Rib			11·337	13·27	0·2525	0·2956	—	—	
	Plain			14·253	13·22	0·3229	0·2995	—	—	
Piece C		1·0664	1·0781							Picked up, 16.1.02.
	Rib			14·307	13·27	0·3187	0·2956	—	—	
	Plain			6·375	13·22	0·1444	0·2995	—	—	
Piece B		0·4770	0·4832							Picked up, 15.1.02.
	Rib			6·400	13·27	0·1425	0·2956	—	—	
	Plain			1·4595	13·22	0·0331	0·2995	—	—	Bottom in Tank.
Piece A		0·1092	0·1104							Picked up, 14.1.02.
	Rib			1·465	13·27	0·0326	0·2956	—	—	

WESTON—WATERVILLE (1885) REPAIR,

JANUARY 17TH, 1902.

EXPENDITURE. NEW CABLE, SIEMENS' TYPE 8553, TWIN CORE.

Tank.	Type.	Cut off for Splices. N.M.	Laid in Section. N.M.	Remaining on board. N.M.	Total Shipped. N.M.
After	Siemens' 8553	·008 ·008 } 0·016	2·595	2·028 (Core=2·050)	4·639 (Core=4·690)

EXPENDITURE. CABLE PICKED UP DURING REPAIRS.

Total length = 2·5226 N.M.

	N.M.	N.M.	
*Piece A.	= 0·1092	= 2·4976	Coiled in "Buccaneer's" Fore Tank.
* ,, B.	= 0·4770		
* ,, C.	= 1·0664		
* ,, D.	= 0·8450		
Cut off for damaged places and ends	= 0·0250		
TOTAL	= 2·5226 N.M.		

* NOTE.—These pieces are electrically and mechanically perfect.

NOTE re mean bottom temperature calculated from tests taken from ship and shore.

WESTON—WATERVILLE (1885) CABLE.

Bristol Channel Repairs, January, 1902.

January 17th, 1902. *C.R. test from ship to Weston:*

Length in circuit = 91·515 N.M. each.

Total C.R. at 75° F. (of Plain and Rib cores) = 2459·93 ω.

Total C.R. measured of Loop (corrected) = 2325·2.

Calculated temperature by Silvertown co-efficient = 48° F. By C.F. and T's co-efficient = 49°·8 F.

Mean = 48°·9 F.

January 17th, 1902. *C.R. test from ship to Waterville:*

Length in circuit = 239·46 N.M. each core.

Total C.R. at 75° F. (of Plain and Rib cores) = 6370·98 ω.

Total C.R. measured of Loop (corrected) = 6025·0.

Calculated temperature by Silvertown co-efficient = 48°·25 F. By C.F. and T's co-efficient = 50°·0 F.

Mean of the two = 49°·12 F.

Waterville's Test after Completion of Repairs.

Total C.R. at 75° F. (of Plain and Rib cores) = 8830·91 ω.

Total C.R. measured of Loop = 8374·

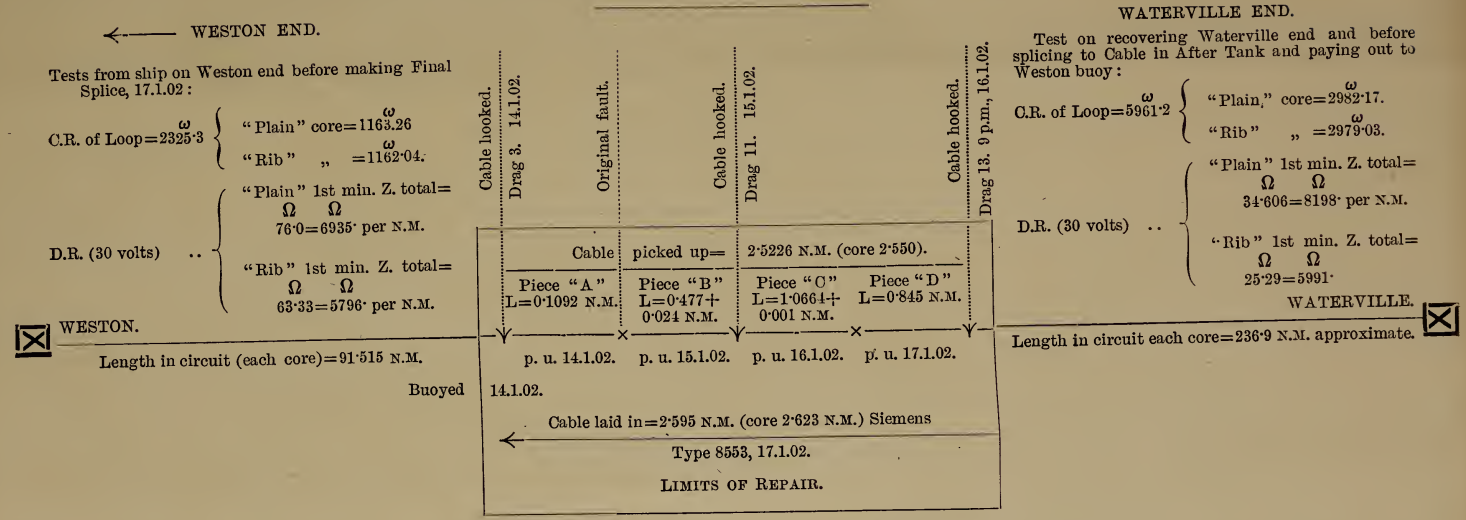
Calculated temperature by Silvertown co-efficient = 49°·5 F. By C.F. and T's co-efficient 51°·1 F.

Temperature at position of Final Splice, 17.1.02, taken by Deep Sea Thermometer:

Surface = 51° F.

Bottom = 49°·2 F.

DIAGRAM OF REPAIRS BY THE S.S. "BUCCANEER." 17.1.02.



Final Splice, 17.1.02.
Bottom Temperature, 49°·2 F.

Length in circuit each core=239·46 N.M.

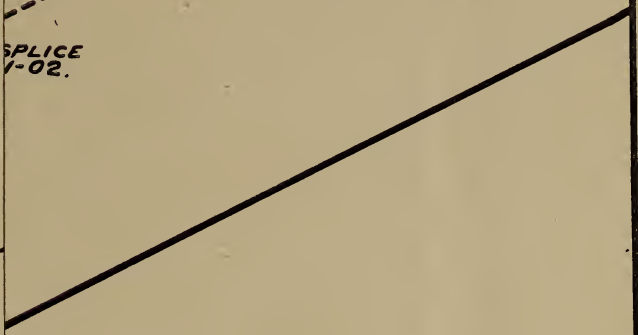
Tests from ship on Waterville end before final splice:

C.R. of Loop=6025· ω
"Plain" core=3014·1 ω
"Rib" „ =3010·9 ω

D.R. (30 volts)
"Plain" core 1st min. Z. total= Ω Ω 29·23=7000· per N.M.
"Rib" „ 1st min. Z. total= Ω Ω 25·333=6066· per N.M.

WATERVILLE.

NOTE.—The arrowheads denote the direction of laying or picking up.



COMMERCIAL CABLE Co

WESTON-WATERVILLE No1 CABLE 1885

REPAIR BY

"S.S.BUCCANEER"

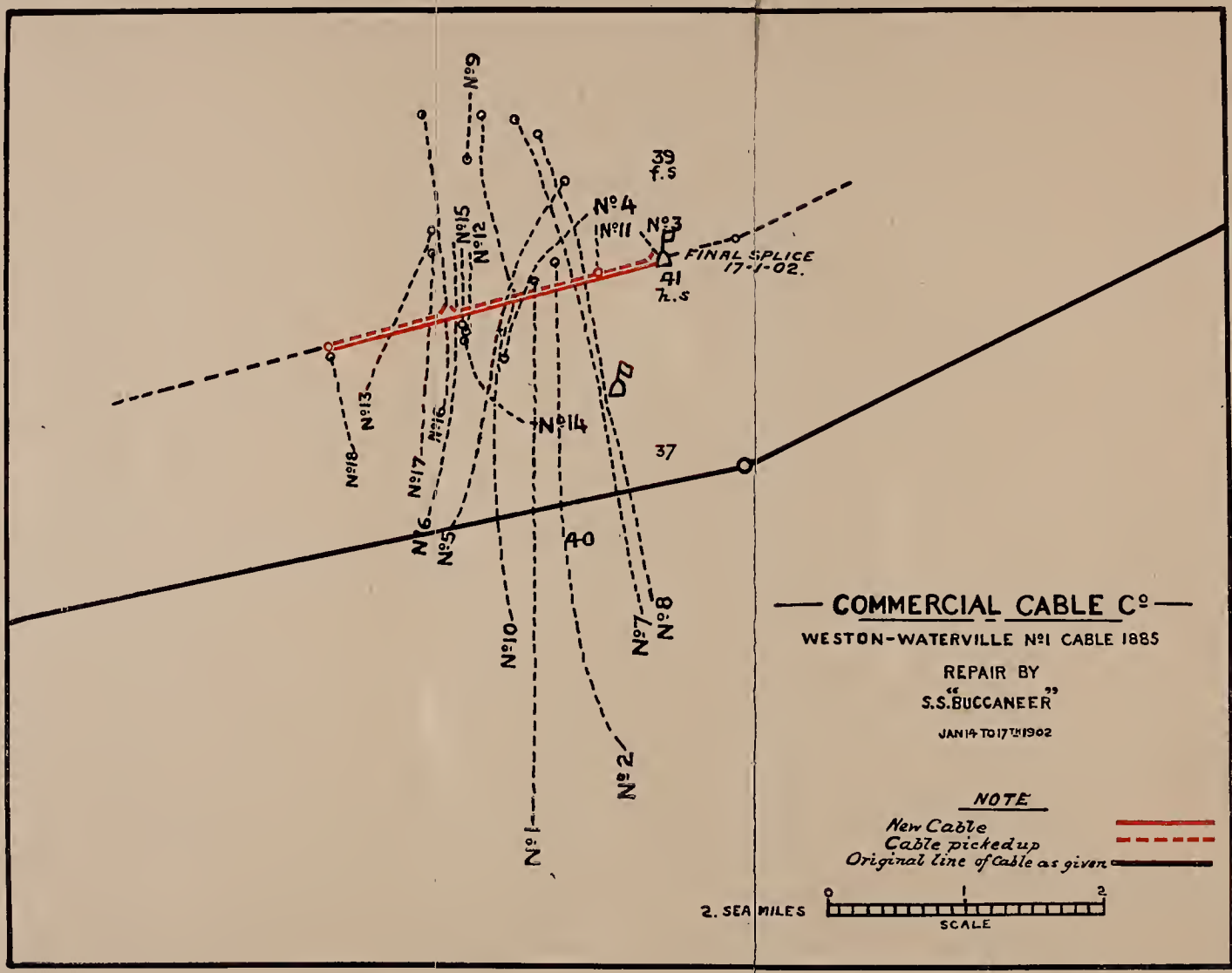
JAN 14 TO 17TH 1902

NOTE

New Cable

Cable picked up

Original line of Cable as given


No9
39
f.s
No4
No11
No3
No15
No12
FINAL SPLICE
17-1-02.
41
h.s
No13
No14
No18
No17
No16
37
No6
No5
40
No10
No7
No8
No2
No1
COMMERCIAL CABLE Co
WESTON-WATERVILLE No1 CABLE 1885
REPAIR BY
"S.S.BUCCANEER"
JAN 14 TO 17TH 1902
NOTE
New Cable
Cable picked up
Original line of Cable as given
2. SEA MILES
0
1
2
SCALE

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Havre—Waterville Cable Repair Expedition.

FEBRUARY, 1902.

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REPAIR

TO THE

Weston—Waterville 1885 Cable.

1901.

Presented by

The India Rubber, Gutta Percha and Telegraph Works Company (Limited).

Havre—Waterville Cable Repair Expedition.

SEPTEMBER, 1902.

S.S. "BUCCANEER."

COMMERCIAL CABLE COMPANY'S CHARTER.

Havre—Waterville Cable Repair Expedition.

FEBRUARY, 1902.

S.S. "BUCCANEER."

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GENERAL INDEX.

Havre—Waterville Cable Repair Expedition, February, 1902.

S.S. "BUCCANEER."

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COMMERCIAL CABLE COMPANY.

HAVRE—WATERVILLE REPAIR, FEBRUARY, 1902.

S.S. "BUCCANEER."

GENERAL REPORT.

GENERAL REPORT.

Silvertown,
London, E.,
February 24th, 1902.

M. H. Gray, Esq.,
Silvertown.

Dear Sir,

The "Buccaneer" was ordered on January 27th to get ready for sea, news having been received that the Havre—Waterville Cable had broken down on the previous day. As there was an Engine Survey on at the time she was not able to sail before January 30th, when she left Silvertown at 4 p.m., having taken in 6·356 n.m. of Commercial Co.'s cable, sent from Messrs. Siemens.

Mr. Gott, representing the Commercial Cable Co., joined the ship off the Works.

The same evening we anchored in Prince's Channel owing to heavy snow and sleet squalls.

On 31st we ran down Channel with a strong NE gale, and when off the Tongue Lightship a heavy cross sea struck the ship on Port Bow, starting five intermediate frames in forecastle, but not causing damage enough to demand immediate attention. As the weather showed no signs of moderating it was decided to run into Spithead, and we anchored there at 10 p.m., landing the Channel Pilot the next morning, we being unable to land him before on account of the weather.

On Monday, February 3rd, the weather having moderated, we proceeded to cable ground, 15 n.m. NW of Cherbourg, and the same evening on the 2nd Drag got the cable and spoke Havre. As tests were O.K. to Havre the end was buoyed, and 0·086 n.m. picked up

westward, to fault. This proved to be a break, the wires being badly corroded and showing signs of chafe. While picking up this end the lights of our Mark Buoy suddenly disappeared, and on investigation the next morning it was found that the clamps on the lamp-hanger had been unscrewed, and that the lanyards had been cut. This was evidently the work of fishermen, who were observed in the vicinity.

On Tuesday afternoon, on Drag No. 4 we got the Waterville end of cable and spoke Waterville. Tests O.K. We picked up 0·313 N.M. of cable to westward to ascertain condition of cable, which after one bad place, close to ship, was found to be in good condition.

Previously to this we had picked up 0·080 N.M. to a broken end. This length was much corroded, and in places only one or two wires holding. The inner serving was covered in parts with red rust.

When splicing tank section on to Waterville end the lights on the Havre end cable buoy suddenly disappeared. This necessitated our hanging on to the cable till daylight. On coming up to the buoy it was found that one Dioptric lamp had been taken off and that the other lamp—a Miller's Globe—had been taken off but put back again and roughly lashed to the hanger.

On Wednesday, February 5th, the final splice was slipped in 41 fms. and we proceeded to Plymouth to land Mr. Gott, reaching there on Thursday morning. Mr. Gott received telegram here that final tests taken from Waterville were highly satisfactory. Mr. Gott left the ship at 9.30 a.m. on Thursday, February 6th, and proceeded by train to London.

As before mentioned the cable near the fault was much corroded and chafed in places, the soundings which we took indicated "hard bottom," probably gravel, as given on Admiralty Charts, but we could not obtain any specimen of the bottom, which would have been interesting in order to ascertain if any special cause existed for the corrosion. At Mr. Gott's request all joints were brass taped and the yarn serving over splices was compounded.

As when we spoke Waterville, on Tuesday, February 4th, we had received instructions from Mr. Gott and also "Silvergray," that on completion of Havre—Waterville repair we were to proceed to Brignogan to repair the French Co.'s cable off there, we took extra provisions in while at Plymouth, also splicing cable up to be in readiness for work, and would have sailed for Brignogan on Thursday evening, February 6th, but, on account of unfavourable weather reports, did not do so till the Friday morning. After completion of this repair, which is the subject of further report, we arrived in London on February 18th.

Yours faithfully,

F. C. CRAWFORD.

S.S. "BUCCANEER."

LIST OF STAFF, OFFICERS, CABLE HANDS AND CREW.

LIST OF STAFF, OFFICERS, CABLE HANDS & CREW.

Mr. F. C. Crawford, Engineer in Charge.
,, H. E. Cann, Electrician.
,, E. H. Walker, Accountant.
,, T. W. Sharp, Master.
,, A. Troan, Chief Officer.
,, Victor Jones, 2nd ,,
,, F. G. Ramsay, 3rd ,,
R. Murray, Carpenter.
J. Kelly, Boatswain.
Boatswain's Mate.
4 Quartermasters.
7 Able Seamen.
1 Deck Boy.
Mr. A. White, Chief Engineer.
,, W. McFarlane, 2nd ,,
,, C. Ball, 3rd ,,
,, J. Ketley, 4th ,,
J. Maguire, Donkeyman.
6 Firemen.
4 Trimmers.
A. Patrick, Chief Steward.
2nd Steward and Storekeeper.
Chief Cook and Baker.
2nd Cook and Butcher.
Pantryman.
1 Assistant Steward for Saloon.
1 Engineers' Steward.
1 Officers' Boy.
1 Scullion.

CABLE HANDS.

D. Smith,	Foreman.
R Keys,	Leading Hand.
A. Day,	Cable Hand.
James Ayers,	,, ,,
Thomas Ayers,	,, ,,
George Ayers,	,, ,,
William Ayers,	,, ,,
M. Coleman,	,, ,,
C. Brown,	Fitter.
A. E. Newton,	Fitter's Mate.
R. Welsh,	Jointer.

Staff	3
Cable Hands	11
Officers and Crew	43
	57

Mr. J. Gott, Commercial Cable Company's Representative.

S.S. "BUCCANEER."

DISTRIBUTION OF WEIGHT IN SHIP ON LEAVING GRAVESEND.

DISTRIBUTION OF WEIGHT IN SHIP ON LEAVING GRAVESEND.

	Tons.
Cable in fore tank	8·539
,, after ,, ...	39·87
Coal in bunkers	230·00
Fresh water in after fresh water tank	13·00
,, ,, ,, cones	8·00
,, ,, ,, side tanks	4·50
Water in ballast tanks forward	70·00
,, ,, ,, ,, aft	15·00
Boatswain's stores forward	2·00
Carpenter's ,, ,, ...	·50
Cable stores and buoys	11·00
Engine room stores	3·00
Water in main boilers	30·00
Steward's stores	5·00
Extra chain cable	1·00
Spare anchors' ropes	2·00
,, propeller	3·00
Deck machinery	10·00
Total ...	456·409

Draught of ship { Fore 12′ 8″ / Aft 13′ 8″ } mean 13′ 2″.

TABLE SHOWING DISTRIBUTION OF CABLE IN SHIP ON LEAVING GRAVESEND.

FORE TANK.

Piece.	Type.	Siemens' Factory No.	Length. N.M.	Weight. Tons.
D ...	L.1. ...	8553 ...	0·845 =	2·890
C ...	„ ...	„ ...	1·066 =	3·646
B ...	„ ...	„ ...	0·477 =	1·632
A ...	„ ...	„ ...	0·109 =	0·371
		TOTAL =	2·497 =	8·539

AFTER TANK.

Type.	Siemens' Factory No.	Length. N.M.	Weight. Tons.
H.1. ...	8514 ...	3·356*	33·000
„ ...	„ ...	3·000	6·872
L.1. ...	8553 ...	2·010	
	TOTAL =	8·366	39·872

* ·220 N.M. bottom end of this is L.I. No. 8513 10 No. 8.

SUMMARY.

	N.M.	TONS.
Fore Tank Picked-up Cable	= 2·497	= 8·539
After Tank, New Cable	= 8·366	= 39·872
TOTAL	= 10·863	= 48·411

COMMERCIAL CABLE COMPANY'S CHARTER.

HAVRE—WATERVILLE REPAIR, 1902.

S.S. "BUCCANEER."

CONSTANTS FOR PICKING-UP AND PAYING-OUT DRUM.

Circ. of Drum = 17′ $2\frac{1}{2}$″

Type.	Circ. in inches.	Revs. per N.M.	Log.	Fms. per Rev.
Siemens' H.I. (new) ... 8514	4·375	346·385	2·5395594	2·929
,, L.I. 8513	3·650	347·580	2·5410551	2·919
,, L.I. (twin core) 8553	3·465	347·886	2·5414375	2·916
,, H.I. (old) ... 8514	4·250	346·590	2·5398169	2·927
Grappling Rope—				
4 × 6 (old)	4·646	345·940	2·5390016	2·932
Buoy Rope—				
(Steel and Manilla)				
4 × 4 (new)	3·860	347·233	2·5406213	2·922
3 × 3 (new)	2·700	349·159	2·5430228	2·905

DESCRIPTION OF CABLE.

Siemens' L.I. Cable.—Their Factory No. 8553.

TWIN CORE CABLE.

Conductor :—Solid plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs. per N.M.

Two cores as above—one marked with "Rib" the other plain—laid up, wormed and served with tanned jute yarn.

Sheathing :—15 G homo wires, No. 9 L.S.G.=″·144 dia. when galvanised.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter=1″·103.

Weight in air, dry=3·293 tons per N.M.
,, ,, wet=3·420 ,, ,,
,, in sea water=2·241 ,, ,,

Siemens' L.I. Cable.—Their Factory No. 8513.

Conductor :—Strand of 7 copper wires ″·023, weighing 70 lbs. per N.M.

Dielectric :—Gutta percha to ″·205, weighing 75 lbs. per N.M.

Serving :—Tanned jute yarn.

Sheathing :—10 B.B.G.I. wires=″·180 dia. when galvanised.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter=1″·160.
Weight in air, dry=

Siemens' H.I. Cable.—Their Factory No. 8514.

Core and Serving same as in No. 8513.

Sheathing :—10 B.B.G.I. wires=″·238 dia. when galvanised.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter=1″·393.

Weight in air, dry=5·437 tons per N.M.
,, ,, wet=5·526 ,, ,,
,, in sea water=3·873 ,, ,,

NOTE.—All the above particulars taken from samples.

HAVRE—WATERVILLE REPAIR, 1902.

S.S. "BUCCANEER."

ENGINEER'S GENERAL DIARY.

STEAMING DOWN CHANNEL.

S.S. "BUCCANEER."

HOUR.	
	THURSDAY, JANUARY 30th (1st DAY OUT).
A.M.	
8.0	Hands joined ship off Silvertown.
9.0	Commenced unmooring ship.
10.0	Finished unmooring ship and made fast with ropes. Commenced taking in 6·356 N.M. of cable, H.I. 8514, barged from Messrs. Siemens', and coiling it into after tank.
P.M.	
1.50	Mr. Gott (C. C. Co.'s representative) joined ship.
4.0	All cable and stores on board. Let go moorings and proceeded down river, Pilot Twist in charge.
6.40	Off Gravesend Pilot Twist left, and Pilot Letten boarded and set on for Cherbourg.
7.35	Mucking Light abeam.
8.45	Nore Light abeam.
9.50	Girdler Light Vessel abeam.
10.30	Let go anchor in Princes Channel in 13 fms. and veered to 60 fms.
MID.	Mod. SE gale, with heavy squalls and sleet. Bar. 30·52. Ther. 46°.
	Draught leaving Gravesend { Fore. 12′ 8″ / Aft. 13′ 8″ } Mean 13′ 2″
	STEAMING TOWARDS CHERBOURG.
	FRIDAY, JANUARY 31st (2nd DAY OUT).
A.M.	
4.0	At anchor. Mod. NE gale, with heavy squalls of sleet. Bar. 30·60. Ther. 40°.

HOUR.	FRIDAY, JANUARY 31st (2nd DAY OUT)—*Contd.*
A.M.	
8.0	Wind increasing to fresh gale. Weighed anchor and proceeded towards Cherbourg. Bar. 30·60. Ther. 42°.
9.5	Passed Tongue Lightship.
10.0	On passing Tongue lightship a heavy sea struck ship on Port bow, starting five intermediate frames in Port forecastle.
11.0	Gull Lightship abeam.
NOON.	Passing Dover signalled for boat to take off pilot. Stood in close to pier, but could not get any reply, the wind blowing a fresh north-easterly gale and a high sea running. Observed Channel boats unable to go alongside pier. Stood on for Dungeness. Bar. 30·50. Ther. 42°.
P.M.	
1.35	Passed Dungeness.
3.50	Royal Sovereign Lightship abeam.
4.0	Strong NE gale. Overcast and squally. Bar. 30·50. Ther. 41°. Decided to go to Spithead and await finer weather.
4.35	Beachy Head Lighthouse abeam.
6.0	Strong ENE gale. Overcast and squally. Bar. 30·50. Ther. 40°.
7.30	Passed Owers Light vessel.
8.0	Similar wind and weather. Bar. 30·50. Ther. 40°.
9.40	Brought up in 9 fms. with starboard anchor, and veered to 60 fms.
MID.	Strong ENE gale, and clear weather. Bar. 30·50. Ther. 39°.

ANCHORED IN SPITHEAD HARBOUR.

SATURDAY, FEBRUARY 1st (3rd DAY OUT).

A.M.	
4.0	Strong NE gale and clear weather and rough sea. Bar. 30·50. Ther. 54°.

HOUR.	SATURDAY, FEBRUARY 1st (3rd DAY OUT)—*Contd.*
A.M.	
8.0	Similar wind and weather. Bar. 30·50. Ther. 54°.
8.30	Hailed a fishing boat, and got her to send boat to take Pilot Letten ashore.
8.45	Boat came along side and Pilot Letten left ship. Telegram sent by pilot to— "'Silvergray and Graysilver, London.' 10 p.m. Friday, anchored Spithead owing to stress of weather. All well. Crawford."
NOON.	Strong NE gale and clear weather. Bar. 30·40. Ther. 53°.
P.M.	
4.0	Strong NE by E gale, with heavy squalls. Clear weather. Bar. 30·28. Ther. 48°.
7.45	Veered away to 75 fms. of chain.
8.0	Strong NE by E gale. Heavy squalls. Clear weather. Bar. 30·20. Ther. 51°.
MID.	Similar wind and weather. Bar. 30·15. Ther. 52°.
	SUNDAY, FEBRUARY 2nd (4th DAY OUT).
A.M.	
4.0	Mod. NE gale and clear weather. Bar. 30·08. Ther. 50°.
8.0	Strong NE gale and overcast. Light snow squalls. Bar. 30·06. Ther. 50°.
10.30	Tug "Empress" came alongside and took telegrams ashore. Telegram sent to: "'Silvergray, London.' Spithead, Sunday, still weather bound. All well. Crawford."
NOON.	Fresh ENE gale and overcast with fine snow. Bar. 30·09. Ther. 51°.
P.M.	
4.0	Strong ENE breeze and overcast. Fine sleet. Bar. 30·01. Ther. 51°.
8.0	Fresh ENE breeze. Drizzling rain and misty. Bar. 30·00. Ther. 50°.

HOUR.	SUNDAY, FEBRUARY 2nd (4th DAY OUT)—*Contd.*
MID.	Fresh NE breeze. Overcast with occasional snow and sleet. Bar. 30·00. Ther. 55°.

STEAMING TO CABLE GROUND.

MONDAY, FEBRUARY 3rd (5th DAY OUT).

A.M.	
4.0	Mod. ENE breeze and overcast. Mod. sea. Bar. 30·00. Ther. 47°.
7.0	Weighed anchor, and set on for position of fault off Cherbourg. From Nab Lightship S., 32° E. (true), 52 N.M.
8.0	Similar wind and weather, and hazy.
8.5	Passed Nab Lightship.
NOON.	Mod. NE breeze and overcast, and hazy. Bar. 29·80. Ther. 53°.
P.M.	
0.10	Sounded in 31 fms. (Thomson's Tube) Hard.
0.50	,, ,, 42 ,, ,, ,, ,,
1.20	,, ,, 36 ,, ,, ,, Rocky.
1.30	In position. Decided to make land to check position.
1.40	Sounded in 26 fms. (Thomson's Tube) Rocky.
2.40	,, ,, 21 ,, ,, ,,
3.0	Off Cherbourg. Ran 15 N.M. N, 18° W (true).
4.0	Mod. NE breeze and overcast. Bar. 30·00. Ther. 49°.
4.45	Sounded in 41 fathoms (Thomson's Tube) Hard.
4.47	In position to put down mark buoy "P" No. 42. Paid out buoy's moorings and streamed buoy. *Buoy's Moorings.* 2 dioptric lamps. $\frac{5}{8}$" Bridle, 20 fms.; $\frac{5}{8}$" and 30 fms.; $\frac{9}{16}$" chain; Mushroom 7 cwt. Position of buoy "P" { Lat. 49° 57′·6 N. Long. 1° 39′·9 W.

HOUR.	MONDAY, FEBRUARY 3rd (5th DAY OUT)—*Contd.*
P.M.	
4.52	Lowered cutter, and sent her to put lamps on buoy.
5.0	Cutter returned to ship and was hoisted.
6.35	In position to grapple, lowered ordinary wooden protected grapnel, with 10 fms. $\frac{7}{8}$" chain, and commenced paying out 4 × 6 rope.
	DRAG No. 1.
6.40	Paid out to 100 fms. of rope and chain.
7.0	No strain.
7.30	,, ,,
8.0	,, ,, Mod. NE wind and overcast. Bar. 30·00. Ther. 49°.
8.15	No strain.
8.20	Commenced picking up grapnel.
8.25	Grapnel at bows. No sign of cable. Set on for new position to grapple.
8.45	In position, lowered same grapnel and chain, and commenced paying out 4 × 6 rope.
	DRAG No. 2.
8.50	Paid out 100 fms. of rope and chain.
8.55	Strain steadily rose to 25 cwt.
8.57	,, steady at 25-30 cwt. Commenced picking up grapnel.
9.7	50 fms. of rope and chain out. Strain = 30 cwt.
9.12	Grapnel at bows with cable H.I., No. 8514, 10 No. 3's. Got drum ropes along, and made fast to each side of cable.
9.45	Cut cable and hove grapnel inboard, took grappling chain off drum.
9.45	Suddenly lost sight of lights on mark buoy.
10.0	Took starboard drum rope (Havre end) to drum, and commenced heaving in on same.

HOUR.	MONDAY, FEBRUARY 3rd (5th DAY OUT)—*Contd.*
P.M.	
10.5	End of cable on board, opened out end, and commenced testing.
10.15	Got Havre O.K.
10.30	Preparing to buoy Havre end, and pick up short piece towards fault.
10.45	Finished testing. Tests to Havre O.K. Sealed end, and bent mooring chain on to end of cable.
MID.	Paid out buoy's moorings and streamed buoy "S" No. 43. *Buoy's Moorings.* 2 globe lamps. $\frac{5}{8}$" Bridle, 20 fms.; $\frac{5}{8}$" and 30 fms.; $\frac{9}{16}$" chain; Mushroom 4 cwt. 1 qr. 16 lbs. This buoy drifted aft, close alongside, and on rising to a swell the flagstaff went through the cable cutter which was swung out. Fresh NE breeze. Overcast and misty. Bar. 30·04. Ther. 53°. Position of buoy "S" { Lat. 49° 57′·3 N. / Lon. 1° 41′·4 W.

GRAPPLING FOR WATERVILLE END.

TUESDAY, FEBRUARY 4th (6th DAY OUT).

A.M.	
0.20	Commenced picking up short piece towards fault.
0.27	End on board and opened out. Commenced testing.
0.55	Finished testing. Waterville end faulty. Break reported close to ship.
1.0	End of cable off drum. Set Ind. Zero. Ind. 22 revs. Broken wire passed inboard.
1.15	Last end on board. *Cut 4 fms. off.*
1.20	End off drum. Ind. 28 revs. = ·082 N.M. picked up. *Piece "E."* Set on to dodge off buoys till daylight.
4.0	Fresh NE breeze and overcast. Bar. 30·05. Ther. 50°.

HOUR.	TUESDAY, FEBRUARY 4th (6th DAY OUT)—*Contd.*
A.M. 8.0	Similar wind and weather. Bar. 30·05. Ther. 50°.
9.40	In sight of Mark Buoy "P." Observed that both lamps were gone.
9.50	Up to buoy. Lowered cutter and sent her away with drum rope to dismantle it. Found that lamphangers had been unscrewed and lanyards cut.
10.0	Knocked up tumbler and commenced heaving up buoy's moorings.
10.15	All moorings on board. Set on to put fresh lamps on cable buoy "S."
10.25	Up to cable buoy "S." Lowered cutter and sent her away to put lamps on buoy. 1 Dioptric and 1 Miller's Globe.
10.55	Cutter returned to ship and was hoisted.
11.25	In position to grapple. Lowered ordinary wooden protected grapnel with 10 fms. $\frac{7}{8}$" chain, and commenced paying out 4×6 rope.
	DRAG No. 3.
11.30	Paid out 100 fms. of rope and chain.
11.45	No strain.
NOON.	,, Fresh NE breeze. Overcast. Bar. 30·05. Ther. 57°. Position by D.R. { Lat. 49° 45′·18 N. Lon. 1° 40′·0 W.
P.M. 0.20	No strain. Commenced picking up grapnel.
0.25	Grapnel at bows. No sign of cable. Set on for new position.
1.7	In position. Lowered same grapnel, and commenced paying out 4×6 rope.
	DRAG No. 4.
1.12	Paid out to 100 fms. of rope and chain.

HOUR. P.M.	TUESDAY, FEBRUARY 4th (6th DAY OUT)—*Contd.*
1.30	No strain.
2.0	,,
2.11	Strain rose to 25 cwt. steadily. Commenced picking up grapnel. 50 fms. of rope and chain out. Strain=22 cwt.
2.20	Grapnel at bows with cable H.I., No. 8514, 10 No. 3's. Got drum ropes along and secured to each side of cable.
2.25	Hove grapnel inboard. Took grappling chain off drum.
2.55	Cut cable. Took Port drum rope to drum and commenced heaving in on it. End off drum. Set Ind. 0. Commenced testing.
3.0	Finished testing. Found this to be a short faulty piece. Resumed picking up.
3.15	Last end inboard. *Cut 4 fms. off* (badly damaged).
3.20	End off drum. Ind.=26 revs.=·076 N.M., *Piece "F."* The whole of this piece was greatly corroded and in places holding together by one wire.
3.28	Commenced heaving in on Starboard drum rope.
3.35	End on drum. Set Ind. zero.
3.40	End abaft drum. Commenced testing. Got Waterville O.K.
4.0	Moderate NE breeze. Overcast and misty. Bar. 30·02. Ther. 50°.
4.15	Finished testing. Waterville O.K. Resumed picking up to ascertain the condition of cable.
5.8	"'Silvergray' to Crawford. "Commercial Cable Coy. have agreed to allow 'Buccaneer' to repair French cable off Brest after completion Havre—Waterville repairs. You will have to land Mr. Gott at nearest convenient port, and receive telegraphic confirmation from there of the Havre-Waterville cable being in good working order. When you have this message from Havre or Waterville you can proceed to Brignogan, near Brest. There report your arrival to the Superintendent of the French Company. He will have

HOUR. P.M.

TUESDAY, FEBRUARY 4th (6th DAY OUT)—*Contd.*

charts and instructions from his principals. The Commercial Company agree that any cable remaining over after the Havre—Waterville repair may be used by the French Company."

5.10 Ind. = 50 revs. = ·145 N.M. Cut cable at bad place (*Piece "G"*) and resumed picking up. Reset indicator. Cable coiling badly.

5.40 Ind. = 63 revs. = ·183 N.M. Stopped picking up, cable in good condition. Commenced testing to Waterville again.

6.10 Finished testing. Tests O.K. to Waterville. Got end of H.I., No. 8514, from after-tank and commenced opening out same for splice.

7.0 Finished opening out after-tank end for splice.

8.0 Mod. NE breeze. Overcast and misty.
Bar. 30·02. Ther. 50°.

JOINING UP HAVRE AND WATERVILLE.

9.0 Cut Waterville end 15 fms. abaft drum (thus reducing *Piece "H"* to ·168 N.M.) and commenced opening out for splice. Waterville end to make splice with new cable in after-tank.

9.35 Commenced joint. *Cut* 8 *fms. off* tank end.

10.0 A yawl was seen hovering about the buoy on Havre end. He was seen to put out his lights. A few minutes after the buoy lights disappeared.

11.0 Finished joint. (All bare core and joint brass taped.)

11.15 Commenced splice.

MID. Copy of telegram sent:

"Gott to S.H.R. On Monday night and again last night (Tuesday) we had the lighted lamps stolen from our buoys, by some fishermen we suppose. Three of these lamps are Ridsdale's copper dioptric buoy lamps, and one Miller's globe lamp. The names are on the lamps — Ridsdale, Minories, London. Our operations have been seriously delayed by these acts of brigandage, and danger to navigation results from them. A

HOUR. A.M.	TUESDAY, FEBRUARY 4th (6th DAY OUT)—*Contd.*
	yawl was seen hovering about the buoy on Monday. Last night the lamps were stolen at ten o'clock. The fellow put out his own light to mystify us. The buoys were moored eighteen miles off Cherbourg, and seventeen from La Hogue. Can you bring this before the authorities in this vicinity?"
	WEDNESDAY, FEBRUARY 5th (7th DAY OUT).
1.20	Finished splice. Stopped work for night on account of lamp being stolen off cable buoy on Havre end, and not being able to see buoy.
4.0	Mod. SE breeze. Overcast. Bar. 30·00. Ther. 46°.
7.50	Copy of telegram to : "'Silvergray, London.' Your message *re* French Company's repair understood. Now about to pay out to buoy on Havre end, and after splice proceed to Plymouth to get results and land Mr. Gott. We need four buoy lamps, having had ours stolen off buoys. Please ask Works to send these to Plymouth, also new cable reglulation lamps ordered before leaving. Will wire, cable remaining later. All well. Crawford."
8.0	Fresh SE breeze. Overcast. Bar. 29·97. Ther. 46°.
8.5	Commenced paying out H.I. cable, No. 8514, towards buoy on Havre end. Course S 60° E true.
8.6	First end of splice on drum. Ind. Zero.
8.11	Ind. = 86·75 revs. = 0·250 N.M. Strain = 18 cwt. Engine = 20 revs.
8.15	Ind. = 173·50 revs. = 0·500 N.M. Strain = 18 cwt. Engine = 20 revs.
8.18	Ind. = 260·25 revs. = 0·750 N.M. Strain = 18 cwt. Engine = 20 revs.
8.22	Ind. = 347·00 revs. = 1·000 N.M. Strain = 18 cwt. Engine = 20 revs.

HOUR. A.M.	WEDNESDAY, FEBRUARY 5th (7th DAY OUT)—*Contd.*
8.26	Ind.=433·75 revs.=1·250 N.M. Strain=18 cwt. Engine =20 revs.
8.31	Ind.=520·50 revs.=1·500 N·M. Strain=18 cwt. Engine =20 revs.
8.35	Ind.=607·25 revs.=1·750 N.M. Strain=18 cwt. Engiee =20 revs.
8.40	Ind.=694·00 revs.=2·000 N.M. Strain=18 cwt. Engine =20 revs.
8.45	Approaching buoy on Havre end. Observed that the buoy lamp had been stolen, and the Miller's Globe had been unhooked from hanger.
8.48	Up to buoy, lowered boat, and sent her away with drum rope to dismantle buoy.
9.3	Ind.=761 revs.=2·195 N.M. paid out. Took cable off drum, and took drum rope to.
9.10	Knocked up tumbler, and commenced heaving up buoy's moorings.
9.15	Hoisted buoy and boat. Boat's crew reported that Miller's Globe had been unhooked and lashed on to flag-staff, so that in swinging the lamp had broken up.
9.48	All Havre buoy's moorings on board. Picked up enough on Havre end for splice. *Cut 3 fms. off* at kink.
10.25	Put hanging ropes and stoppers on both cables, opened out Havre end for splice, and commenced testing.
11.24	Telegram sent to: "Silvergray, London. About to make final splice and proceed to Plymouth. Cable remaining on board, about four knots Havre—Waterville, two knots new twin core, and two and half knots picked up twin core. All belonging to Commercial Co. Crawford."
11.45	Finished testing. Havre and Waterville O.K. *Cut 7 fms. off Havre end*, and cut tank (Waterville) end. Total length laid in =2·153 N.M. Expended for splice = ·008 ,, Total length expended=2·161 ,, Remaining in after tank=6·205 N.M.

HOUR.	WEDNESDAY, FEBRUARY 5th (7th DAY OUT)—*Contd.*
NOON.	Fresh SE breeze. Overcast. Bar. 29·90. Ther. 50°.
P.M.	
0.30	Commenced joint between Havre—Waterville ends. *Cut 8 fms. off Havre end.*
2.10	Finished joint between Havre—Waterville ends (brass taped).
2.15	Commenced splice between Havre—Waterville ends (brass taped).
3.20	Finished splice between Havre—Waterville ends (brass taped).
3.30	Took stoppers off cable and veered away on hanging ropes.
3.35	Bent slip stopper on to bight of cable and cut hanging ropes.
3.40	Let go final splice. Set on full ahead for Plymouth. Position of final splice { Lat. 49° 57′·3 N. Lon. 1° 41′·3 W.
4.0	Fresh easterly breeze. Overcast. Bar. 29·79. Ther. 56°.
8.0	Fresh easterly breeze and overcast. Bar. 29·76. Ther. 50°.
MID.	Similar wind and weather. Bar. 29·67. Ther. 60°.

ANCHORED IN PLYMOUTH HARBOUR.

THURSDAY, FEBRUARY 6th (8th DAY OUT).

A.M.	
0.5	Start Light abeam. Distant, 5 miles.
3.15	Stopped and took Pilot H. Glenn on board.
3.20	Full ahead.
3.40	Passed Plymouth Breakwater.
3.55	Let go anchor in Plymouth harbour.

HOUR.	THURSDAY, FEBRUARY 6th (8th DAY OUT)—*Contd.*
A.M.	
8.0	Mod. ENE breeze and overcast. Bar. 29·50. Ther. 48°.
9.25	Mr. Cook came alongside in shore boat with three Cable Regulations and two Dioptric Lamps.
10.5	Messrs. Fox's launch "Rescue" came alongside.
10.10	Messrs. Gott, Crawford, Cook, and Chief Steward went ashore in Agent's launch.

PICKED-UP PIECES OF CABLE IN FORE TANK AFTER COMPLETION OF HAVRE—WATERVILLE REPAIR.

	Piece.	Type.	Fac. No.	Length.	Remarks.
				N.M.	
Top.	H.	H.1.	8514	0·168	February, 1902, Repairs.
	G.	,,	,,	0·145	,,
	F.	,,	,,	0·076	,,
	E.	,,	,,	0·082	,,
	D.	L.1.	8553	0·845	January, 1902, Repairs.
	C.	,,	,,	1·066	,,
	B.	,,	,,	0·477	,,
Bottom.	A.	,,	,,	0·109	,,
			TOTAL	2·968	

NEW CABLE IN AFTER TANK AFTER COMPLETION OF HAVRE—WATERVILLE REPAIR.

Type.	Siemens' Factory No.	Length. N.M.	Weight Tons.
H.1. ...	8514 ...	1·195*	= 21·82
,, ...	,, ...	3·000	
L.1. ...	8553 ...	2·010	= 6.87
	TOTAL =	6·205	= 28·69

*0·220 (?) N.M. is L.I.

COMMERCIAL CABLE COMPANY.

HAVRE—WATERVILLE REPAIR, 1902.

S.S. "BUCCANEER."

ELECTRICAL REPORT.

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COMMERCIAL CABLE COMPANY.

HAVRE—WATERVILLE REPAIR, 1902.

ELECTRICAL REPORT.

February 18*th*, 1902.

F. C. Crawford, Esq.,
Engineer in Charge,
S.S. "Buccaneer."

Dear Sir,

On Sunday the 26th ult. communication was suddenly interrupted on the Commercial Cable Company's Havre—Waterville Section, and the following day, 27th, orders were received at Silvertown that the "Buccaneer" was to be got ready for sea at the earliest possible date, having been chartered to effect the repair. From information received through the Commercial Cable Company, the break in the cable was 16 miles off Cap de la Hague, approximately 15 miles from Cherbourg on a line to the Needles.

At 5.30 p.m. on the 29th ult. a barge containing 6·356 N.M. of cable, Type 8514, was received alongside "Buccaneer" from Messrs. Siemens Bros.' Works, Charlton. This was in two pieces, respectively 3·356 and 3·000 N.M. The shipment of this cable into the after tank "Buccaneer" was finished on the following day at 3 p.m., 30th. According to a memo. received by Mr. Gott from Mr. F. Jacob, Electrician in Chief to Messrs. Siemens Bros., the longer piece (3·356 N.M.) was made up of a number of short pieces returned from S.S. "Chiltern" and S.S. "Amber," the shorter length being new.

Mr. J. Gott, Electrician in Chief to the Commercial Cable Company, joined the ship at Silvertown (1.50 p.m.), and at 4 p.m.,

30th ult., the "Buccaneer" let go her moorings and proceeded down river, and at 6.40 p.m. discharged River Pilot off Gravesend and proceeded in charge of Channel Pilot, Mr. Letten. Owing to the prevalence of a SE gale, with heavy squalls of sleet and thick weather, we anchored in Prince's Channel at 10.30 the same evening, getting under way again at 8 a.m. the following morning, 31st ult., the wind during the night having increased to a fresh gale. Passed Dover at noon and signalled for boat to take Pilot ashore, but no communication was possible, a fresh NE gale blowing with high sea. By 4 p.m. the wind had increased to a strong gale (NE) and it was then decided to run for Spithead in order to land Pilot and await finer weather for cable operations. We anchored off Spithead at 9.40 p.m. same night, a strong ENE gale blowing. The following morning, February 1st, a strong NE gale prevailed with rough sea, and the Pilot had great difficulty in getting a boat to land him. However, at 8.45 a.m., a passing fishing smack was hailed and the Pilot obtained a passage in her to Portsmouth, taking with him the following message for transmission to London:

"Silvergray and Graysilver, London.

"10 p.m., Friday. Anchored Spithead owing to stress of weather. All well. Crawford."

During the whole of the day a strong NE by E gale prevailed and the following day, 2nd inst., it was still blowing a strong gale. Opportunity was taken whilst lying at anchor, Spithead, to test the cable received from Siemens Bros. on the 29th ult. for C.R., I.C. and D.R., and satisfactory results were obtained. The signalling condensers were overhauled and standardized and batteries compared.

The following data, *re* Havre—Waterville Section, &c., was handed to me by Mr. J. Gott:

The C.R. from Bléville to break = 1188^{ω} at sea temperature 47° F.

Last C.R. of cable complete from office to office (19.1.02) = 8411^{ω}

From Waterville to Bléville = 8303^{ω}

C.R. of underground lines looped between Bléville and Havre = 108·ω

Length of underground line at Havre = 3·217 N.M.

D.R. per N.M. at sea temperature (winter) between 5000 Ω and 6000 Ω.

To "Mirror's" Western splice from Bléville = 70·595 N.M.

C.R. at 75° F. = 1174·36 ω

Capacity = 22·078 mfds.

Estimated distance to fault = 5·5 N.M. to westward of this splice.

At 7 a.m., 3rd inst., the weather moderating, we weighed anchor and proceeded towards position of fault off Cherbourg, and at 2.45 p.m. stopped engines and took bearings off that Port, putting on again at 2.50 p.m. for position of break. Being in position at 4.50 p.m. streamed Mark buoy (No. 42 "P" flag) and sent boat away to place 2 Dioptric lamps on same. After boat's return set on to take up position for grappling. Down grapnel at 6.35 p.m. for Drag 1, up grapnel at 8.25 p.m., no cable. Lowered grapnel again at 8.50 p.m. for Drag 2, and at 8.58 steady strain showing on dynamometer commenced picking up, and at 9.15 p.m. had cable to bows. Havre end of cable was handed to Testing Room at 10.14 p.m. Called Havre—using Sullivan's Galvanometer as speaking instrument and received an immediate reply to call. The cable was put to "Earth" at Havre C.H. for ship to test at 10.18 p.m., and the following C.R. was obtained:

		N.M.
		* 75·595 Ship to Bléville.
C.R. 30 *volts.*	Length in circuit	3·217 L.L. to Havre.
		78·812

Mean of Z = 1250·5 ω

,, ,, C = 1310·75 ω Temperature B.C. = 55° F. Correct at 60° F. Platinoid.

Total C.R. corrected for temperature B.C. etc. = 1279. ω

* Position of "cut in" settled by Mr. Gott.

At 10.30 p.m. (3rd inst.) Havre "free'd" for ten minutes whilst an insulation test was taken from ship which gave

D.R. 30 volts. Length in circuit { Ship to Bléville 75·595 / L.L. to Havre 3·217 } N.M. 78·812

1st min. Z. Total D.R. = 27·8 Ω = 2192 Ω per N.M. at sea temperature.

All readings steady.

(*For full tests see Appendix.*)

Tests being satisfactory the following S.G's. were sent at 10.40 p.m.

"3rd February, 1902. Gott to G.M. and M.E. Monday 10.30 p.m. Cut in this evening O.K. to Havre, now buoy and pick up towards fault, weather promising."

"Gott to S.H.R. Your end will be sealed. Tell W.V. to look out."

Sealed Havre end at 10.55 p.m., and at midnight buoyed same, 43 buoy, "S" flag.

On February 4th, at 0·47 a.m., commenced picking up towards fault. A test had previously been taken to ascertain length in circuit to break (Cann's method), and a report was handed to you stating that the length outboard was anything under quarter a mile. The broken end came inboard when the Indicator = 28 revs. = 0·082 N.M. (4 fms. having been cut off for damaged end) making total length of cable picked up = 0·086 N.M. This was labelled Piece "E" top and bottom. Coiled in fore tank.

Character of Break:

The sheathing wires along the whole length were greatly corroded, and at the actual break the wires were worn to needle points. Half inch of conductor exposed.

At 1.30 a.m. work was discontinued until daylight, and at 9.50 a.m. picked up mark buoy and found that both lamps had been stolen. After renewing lamps on Havre cable buoy, we set on at 10.55 a.m. to take up position to grapple for Waterville end. Lowered grapnel at 11.25 a.m. and caught cable at the second drag

(Drag 4). Cable to Bows at 2.18 p.m., which was handed to Testing Room at 3 p.m. This proved to be the Eastern end, and a test taken (H.E.C's.) gave a negative result. You were immediately notified that only a very short length was in circuit between ship and break, and at 3.4 p.m. the end was given out to coil down in fore tank and pick up towards break, which came in at 3.14 p.m.

Length picked up = 26 revs. = 0·076 and 0·004 cut off damaged = 0·080 N.M.

Length coiled down in Fore tank = 0·076 N.M.

Labelled Piece "F" top and bottom.

Character of Break:

The whole length picked up was greatly corroded, and in places only one sheathing wire and core holding. Red coloured matter observed in places. $\frac{3}{4}$ inch of conductor exposed.

At 3.40 p.m. Waterville end of cable was on p.u. drum, and at 3.50 called Waterville, who put cable to "Earth" for ten minutes.

Took C.R. 30 *volts. Length in circt.* = 433·05 *N.M. approx.*

Mean total C.R. corrected for E.C.'s and temperature B.C. = 7073 ω (see Appendix).

At 4.2 p.m. Waterville "freed" end, and an Insulation test taken from ship gave highly satisfactory results.

D.R. 30 *volts.*

1st min. Z total = 13·906 Ω = 6022· Ω per N.M. at sea temperature.

Tests being O.K., the end was given out to prepare for picking up, Mr. Gott having decided to pick up for some little distance in order to ascertain if cable was in good condition near break. Between 4.42 and 5.8 p.m. the following S.G.'s were received from Waterville:

"S. to Gott. Immediately after repair, ship required to repair P. Q. Brest—Penzance cable. After putting you ashore and ascertaining that our cable is O.K. she is to proceed direct to Brignogan

where charts and tests will await her. She may use what is necessary of the remainder of our spare cable for purpose. Pse. acc. me."

"S. G. to Crawford. Commercial Cable Company have agreed to allow 'Buccaneer' to repair French cable off Brest after completion Havre—Waterville repairs. You will have to land Mr. Gott at nearest convenient port, and receive telegraphic confirmation from there of the Havre—Waterville cable being in good working order. When you have this message from Havre or Waterville you can proceed to Brignogan, near Brest. There report your arrival to the Superintendent of the French Company. He will have charts and instructions from his principals. The Commercial Company agree that any cable remaining over after the Havre—Waterville repair may be used by the French Company.—SILVER-GRAY."

At 5.10 p.m. cut cable at bad place. Ind.=50 revs.=0·145 N.M. (coiled in fore tank).

Piece labelled G. top and bottom.

Resumed picking up on Waterville side at 5.18 p.m., when the following S.G. was received:

"To Crawford. Please telegraph us the length of cable remaining on board after the Havre—Waterville repairs.—SILVER-GRAY."

Between 5.40 and 5.45 p.m. sent S.G.'s to Waterville:

"Gott to G.M. and M.E. Tuesday afternoon got Waterville end. Have cut out several breaks over a bad patch of ground. Now picking up on Wv. end to make sure of good cable, then shall splice on and pay out to Havre end a little over a mile. Weather promising."

"Gott to M.E. Message about 'Buccaneer' repairing French cable and using our spare cable received. I shall land at Plymouth."

At 5.50 p.m. received from Waterville the results of tests taken from Havre on buoyed end (end sealed).

Insulation to sealed end thirty-one megohms (31·) Ω

Capacity ,, ,, ,, twenty-five point three seven mfds. (25·37 mfds.).

Note.—According to the capacity obtained from 75 sheets this test places the cut in at 81·121 n.m. from Havre *Statn.*, and deducting 3·217 n.m.—length of underground from Bléville to Havre,—and *assuming the capacity per N.M. of this length to be the same as the submarine cable*=79·904 n.m. from Bléville hut to buoyed end. *This result is evidently much too high.*

At 6.10 p.m. a C.R. and D.R. test was taken on cable in after tank. Results O.K., and at 6.15 p.m. this cable was given out to prepare for splicing to Waterville end.

At 9 p.m. cut cable, Waterville end, 15 fms. abaft drum.

Length picked up=0·168 n.m.

Labelled "H" top and bottom, and coiled in fore tank.

At 9.35 p.m. (4th inst.) commenced joint between cable in after tank and Waterville end, which was finished at 11 p.m., the joint and all bare core being covered with brass tape. The splice was started at 11.15 p.m. and finished at 1.20 a.m. 5th inst., the splice being compounded over the yarn.

The following S.G. was sent to Waterville at 0.5 a.m., Feb. 5th:

"Gott to S.H.R., February 5th, 1902. 'On Monday night and again last night, Tuesday, we had the lighted lamps stolen from our buoys, by some fishermen we suppose. Three of these lamps are Ridsdale's copper Dioptric buoy lamps and one Miller's Globe lamp. The names are on the lamps, Ridsdale, Minories, London. Our operations have been seriously delayed by these acts of brigandage, and danger to navigation results from them. A yawl was seen hovering about the buoy on Monday. Last night the lamps were stolen at 10 o'clock; the fellow put out his own light

to mystify us. The buoys were moored 18 miles off Cherbourg and 17 from La Hague. Can you bring this before the authorities in this vicinity?' "

At 0.9 a.m. Waterville was instructed to "Earth" for 15 minutes and a C.R. test was taken from ship, giving total C.R. corrected for E.C.'s (by Kempe's formula) and also for temperature of bridge = $7128{\cdot}4^{\omega}$ = total resistance in circuit from "Buccaneer's" western splice + the resistance of 3·348 N.M. spliced up in after tank. Length in circuit = 436·09 N.M. approximate (including 3·348 N.M. in after tank).

Note.—The measured resistance of cable in after tank before making splice, Waterville end, $= 54{\cdot}^{\omega}$ app. therefore $7128{\cdot}4^{\omega} - 54{\cdot}^{\omega} = 7074{\cdot}4^{\omega}$ *C.R. of cable to Waterville from "Buccaneer's" western splice.*

At 0.40 a.m. (5th) cable was "earthed" on board for Waterville to take C.R. and at 0.53 ship received his results.

Total C.R. $= 6940{\cdot}^{\omega} - 54{\cdot}^{\omega}$ (resistance of cable in tank) $= 6886{\cdot}^{\omega}$

Too low—unreliable.

Waterville was asked to test again, which he did, and obtained the following results:

Total C.R. both currents $= 7110{\cdot}^{\omega}$

Deducting $54{\cdot}^{\omega}$ (resistance of cable in tank spliced on to Waterville end) this leaves $7056{\cdot}^{\omega}$ = *resistance from western splice to Waterville C.H.* being $18{\cdot}4^{\omega}$ less than that obtained from ship.

At 1.35 a.m. (5th), Waterville was instructed to "free" end and ship took capacity and Dielectric Resistance tests.

Capacity by Kelvin's Null method. 20 *cells* = 30 *volts* (*using K. and V.'s slides*).

Standard Condenser = 30·2977 mfds. Length in circuit = 436 N.M. approx.

Slide Reading = 8183.

*Total capacity measured** 136·45 *mfds.*

2·154 N.M. was laid of this piece, leaving 1·194 N.M. in tank, when cable was cut and spliced up to Havre end. Therefore, if we deduct 0·425 mfds. (the capacity of the 1·194 N.M.) from 136·45 mfds. this will give us the *total capacity (measured) from final splice to Waterville* = 136·025 *mfds.*

An insulation test was then taken with 30 volts which gave the following result:

1st min. Zinc total = 13·906 Ω = 6063· Ω per N.M. at sea temperature.

(See Appendix.)

Called Waterville at 2.5 a.m. and instructed him to look out for ship's call from 6.30 this morning and to insulate end in office until that time.

Note.—Ship riding to cable all night.

At 7.43 a.m. (5th) Waterville was called and the following S.G. was sent

One from Crawford to Silvergray, acknowledging receipt of orders *re* French cable repairs, and at 8.5 a.m. we started paying-out cable towards Havre buoy. During the whole of the time ship was paying-out, a control test (20 cells) was kept on cable—results entirely satisfactory—and at 9.47 a.m. we had the Havre end on board. At 10 a.m. sent S.G.:

"Gott to G.M. and M.E. Wednesday 10 a.m., both ends on board, now going to make final splice. Have paid out about two and a quarter miles of ship's cable. Delay has been caused by fishermen stealing lighted lamps from our buoys during nights which have been intensely dark. Wind now SE, fresh."

Havre end was handed to testing room at 10.15 a.m., and Havre was called and instructed to "Earth" seven minutes.

* This includes the capacity of 3·348 N.M. of cable spliced up in after tank for paying-out to Havre buoyed end.

C.R. test to Havre end. Length 75·595 N.M. to Bléville.
3·217 L.L. to Havre, 20 cells.

78·812

Total C.R. corrected = 1277·5 ω.
(*See Appendix.*)

Havre was then instructed to free for fifteen minutes (10.26 a.m.), and capacity and D.R. tests were taken from ship.

Kelvin's Capacity test. Null method. 20 cells = 30 volts approx.

Standard Condenser = 20·2379 mfds. | Total capacity measured =
Slide Reading = 5525 | 24·987 mfds.

which at 0·3125 mfds. per N.M. gives a length of 79·956 N.M. in circuit between Ship and *Havre Cable Station.*

Length of land line between Bléville and Havre = 3·217 N.M.

D.R. test from ship to Havre station before making final splice.

Length (accepted) 75·595 N.M. to Bléville.
3·217 N.M. Bléville to Havre

20 cells = 30 volts approx.

Total = 78·812 N.M.

1st min. zinc total = 33·37 Ω = 26·30 Ω per N.M. at sea temperature.
(*See Appendix.*)

From 10·45 to 11·5 Havre was testing for C.R., the end being "Earthed" on board.

Havre results C.R. = 1280 ω *(resistance from Havre C.H. to Ship).*

At 11·15 a.m. (5th), said G.B. to Havre, having previously instructed him to look out for Waterville at one o'clock, and gave out end to prepare for final splice, and at 11.19 a.m., called Waterville and sent the following S.G.:

"'Silvergray, London.' About to make final splice and proceed to Plymouth, cable remaining on board, about four knots Havre—

Waterville, two knots new twin core, and two and half knots picked up twin core, all belonging to Commercial Co. Crawford."

At 11.29 a.m., Waterville "Earthed" ten minutes, and ship took C.R. test.

Length in circuit = 436·09 N.M. approx.

C.R. 30 *volts.*

Total C.R. corrected for E.C.'s (Kempe's formula), and temperature B.C. = 7111·6 ω.

(*See Appendix.*)

NOTE.—This includes the resistance of 1·194 N.M. remaining in After Tank, which was cut off before splicing, viz., 19·2 ω. The resistance therefore of Waterville side—before final splice = 7111·6 ω—19·2 ω = 7092·4 ω.

At 11·45 a.m., the end being "free" at Waterville a D.R. test was taken from ship which gave, viz.:

D.R. 30 *volts.* Length in circuit = 436·09 N.M. approx.

1st min. zinc total = 13·91 Ω = 6088 Ω per N.M. at sea temperature.

(*See Appendix.*)

NOTE.—No correction has been made to reduce for the 1·194 N.M. cut off before splicing, as the D.R. is approximately the same as laid cable, and the temperature likewise.

Tests being highly satisfactory, said G.B. to Waterville at 11·57 a.m., instructing him to look out for Havre at one o'clock, and gave out end to prepare for splicing. The joint was commenced at 0.30 p.m., and finished at 2.10 p.m., all bare core and joint being brass taped. The splice was finished at 3.30 p.m., and at 3.40 p.m. the final splice was slipped, thus completing the repairs to the Havre—Waterville Cable, and ship then set on full speed for Plymouth.

Immediately after slipping final splice, a C.R. test was taken on Cable (top piece) remaining in After Tank to verify indicator length paid out, results of which test are as follows:

C.R. $=19{\cdot}78\ \omega$	Temperature B.C. $=52°$ F.	}	Platinoid.
Leads $=0{\cdot}55$.	Correct at $60°$ F.	}	
$19{\cdot}23\ \omega$.			

C.R. corrected $=19{\cdot}210\ \omega$ [C.R. per N.M. at tank temperature (from previous test) $=16{\cdot}085\ \omega$] therefore $19{\cdot}210-16{\cdot}085=1{\cdot}194$ N.M. of top piece remaining in After Tank. Original length $=3{\cdot}356$ N.M. $-1{\cdot}194$ N.M. $=2{\cdot}162$ N.M. expended [$=2{\cdot}154$ N.M. laid in Havre—Waterville Section, and 0·008 expended for splice].

We arrived and anchored in Plymouth Harbour at 4 a.m., February 6th, and at 9 a.m. Mr Gott received a telegram from Waterville giving results of tests taken on the Havre—Waterville Cable after repairs by T.S.S. "Buccaneer."

Insulation after repairs Z abs. $=12\ \Omega$	per N.M. $=6142\ \Omega$		
,, ,, ,, C ,, $=11{\cdot}3$	,, $=5787$.		

At 9.30 a.m. same day, Mr Gott took leave of ship, and left for shore to entrain for London, and the "Buccaneer" remained at Plymouth taking in provisions and awaiting finer weather until 8.40 a.m. on the 7th inst., when she sailed for Brignogan, Finisterre, France, to repair the Brignogan—Treen Section belonging to La Compagnie Française des Cables Telegraphiques, which repair will form the subject of a separate Report.

In the Appendix will be found the following Tables, etc.:

Revised Lengths and Factory Values at 75° F. of the Havre—Waterville Cable.

Types and Length of Cable Sections after Repair of the—Havre Waverville Cable.

Tests from Ship towards Havre and Waterville on recovering ends.

Tests from Ship towards Havre and Waterville before making final splice.

Distribution of Cable in Tanks, "Buccaneer," and 75° F. values *before* repair.

Distribution of Cable in tanks, "Buccaneer," and 75° F. values after repair.

Expenditure Tables of *New* and *Picked up* Cable.

Diagram of Operations during repairs.

I am,

Dear Sir,

Yours faithfully,

HERBERT E. CANN,
Electrician.

FACTORY ELECTRICAL VALUES AT 75° FAHR.

After Repair by S.S. "Buccaneer," February 5th, 1902.

	Length. N.M.	C.R. Total.	Capacity. Total.	Remarks.
Bleville.	20·632	359·2	6·376	
	2·892	26·89	1·012	
	9·228	160·7	2·861	
	0·407	3·73	0·133	
	3·411	59·38	1·054	
	12·813	223·00	3·970	
	0·845	7·76	0·276	
	1·290	21·44	0·460	
	9·222	160·5	2·847	
	2·406	22·09	0·787	
	7·449	129·67	2·302	"Mirror's" Splice.
	5·000	86·94	1·546	S.S. "Buccaneer," 5.2.02.
	2·154	37·05	0·767	
	41·267	717·58	12·757	
	3·251	30·12	1·095	
	13·994	245·3	4·215	
	1·593	16·47	0·471	
	4·189	38·88	1·483	
	3·321	57·28	1·026	
	20·239	354·9	6·095	
	0·445	7·67	0·138	
	8·545	147·4	2·649	
	0·260	2·38	0·121	
	36·875	636·00	11·455	
	0·770	8·68	0·231	
	6·307	108·8	1·959	
	2·787	46·32	0·995	
	33·835	586·8	10·515	
	48·889	855·36	15·783	
	43·633	761·44	13·327	
	48·788	844·6	15·16	
	1·258	21·77	0·391	
	2·409	41·7	0·748	
	2·822	32·72	0·926	
	1·673	15·29	0·560	
	13·08	226·45	4·065	
	67·201	1177·17	20·347	
	25·294	439·52	7·678	
Waterville.	510·474	8718·95	158·581	
	Underground	at Waterville.		
	0·225	3·536	0·0701	

TYPES AND LENGTHS OF CABLE SECTIONS

After Repair by S.S. "Buccaneer," February 5th, 1902.

	Type.	Length of Section. N.M.	Total Length. N.M.	Remarks.
Bleville C.H.	8512	0·110	0·110	
	Beach	0·050	0·160	
	8517	1·000	1·160	
	8516	6·000	7·160	
	5	9·000	16·160	
	4	4·472	20·632	
	E.T.C. B	2·892	23·524	"Amber."
	8514	9·228	32·752	
	E.T.C. B	0·407	33·159	"Mirror," April, '98.
	8514	3·411	36·570	
	8514	12·813	49·383	
	E.T.C. B	·845	50·228	"Mirror."
	8514	1·290	51·518	
	8514	9·222	60·740	
	E.T.C. B	2·406	63·146	"Mirror," May, '98.
	8514	7·449	70·595	
	8514	5·000	75·595	
	8514	2·154	77·749	* "Buccaneer," 5.2.02.
	8514	41·267	119·016	
	E.T.C. B	3·251	122·267	"Amber."
	8513 A	13·994	136·261	
	E.T.C. B	1·593	137·854	"Chiltern."
	E.T.C. B	4·189	142·043	
	8513 A	3·321	145·364	
	8513 A	20·239	165·603	
	8513 A	0·445	166·048	"Electra."
	8513 A	8·545	174·593	
	E.T.C. B	0·260	174·853	
	8513 A	36·875	211 728	
	8147	0·770	212·498	"Bittern."
	8513 A	6·307	218·805	
	8514	2·787	221·592	"Marmion."
	8513 A	0·724	222·316	
	8513	82·000	304·316	
	8512	92·421	396·737	
	8512	1·258	397·995	"Mirror."
	8512	2·409	400·404	
	E.T.C. B	2·822	403·226	
	E.T.C. D	1·673	404·899	
	8512	81·525	486·424	
	8513	2·000	488·424	
	8514	4·000	492·424	
	8515	9·000	501·424	
	8516	8·000	509·424	
	8517	1·000	510·424	
Waterville Office.	Beach	0·050	510·474	
	Underground	0·221	510·695	

TESTS *from Ship towards* HAVRE (*on recovering Havre End*, 3/2/02).

Length in circuit { Ship to Bléville =75·595 N.M. / Bléville to Havre= 3·217 „ } =78·812 N.M.

(Cable to Earth at Havre C.H.)

CONDUCTOR RESISTANCE 18 cells.

Zinc.	Carbon.	1000 : 1000.
1249	1314	
1247	1315	
1250	1308	Temperature B.C.=55° F. Correct at 60° F. (Platinoid).
1256	1306	
4)5002	5243	
1250·5	1310·75	Total C.R. corrected=1279 ω.

D.R. TEST ON HAVRE END (30 volts). END FREE AT HAVRE C.H.

Mins. Zinc. Lead=nil S.R. 10000.

1 = 24 S.R. 10000 m.p.=1.
2 = 23
3 = 22 Total D.R.=27·8 Ω.
4 = 22 Per N.M.=2192 Ω at sea temperature.
5 = 21

CONSTANT 20 cells through 10^5=267 S.R.=400=667·5 through 1.

TESTS *from Ship towards* WATERVILLE (*on recovering Waterville End*, 4/2/02).

(Cable to Earth at Waterville Station).

CONDUCTOR RESISTANCE 18 cells. 1000 : 1000. Length=433 N.M. approximate.

Zinc.	Carbon.	
7304	6862	Temperature B.C.=50° F. Correct at 60° F. (Platinoid).
7338	6860	
7314	6874	
7306	6850	

Mean total C.R. corrected for E. C.'s (by Kempe's formula) and also for temperature B.C.=7073 ω.

D.R. TEST ON WATERVILLE END. (30 volts). END FREE AT WATERVILLE C.H.

Mins. Zinc. Lead=nil S.R. 10000.

1 = 48 S.R.=10000 m.p.=1 (mean). D.R. Total=13·906 Ω.
2 = 40
3 = 39 D.R. per N.M.=6022 Ω at sea temperature.
4 = 35
5 = 35

CONSTANT 30 volts through 10^5=267 S.R. 400=667·5 through 1.

TESTS *from Ship on* WATERVILLE *End* (*after splicing on* 3·348 N.M. *in After Tank*, 5/2/02).

0.12 A.M. (Cable Earthed at Waterville).

CONDUCTOR RESISTANCE 20 cells. 10000 : 10000.

Zinc.	Carbon.
7289	6989
7249	7190
7189	7019
7205	7059
7110	7120
7090	7140
7100	7144
7090	7145
7150	7010
7240	7170

Length in circuit=436·09 N.M. approximate.

Temperature Bridge Coils=53° F. Correct at 60° F. (Platinoid).

Mean C.R. corrected for E. C.'s (by Kempe's formula) and for temperature B.C.=7128·4 ω.

NOTE.—The C.R. of cable spliced up in After Tank=54· ω, therefore 7128·4 ω − 54· ω=7074·4 ω=total resistance in circuit UP to "BUCCANEER'S" WESTERN SPLICE.

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* D.R. TEST ON WATERVILLE END. CABLE FREE AT WATERVILLE STATION.

1.59 A.M. (30 volts.)

Mins.	Zinc.	Lead=nil S.R. 10000.
1	= 48	S.R. 10000 m.p.=1.
2	= 40	
3	= 35	
4	= 32	
5	= 31	

D.R. total=13·906 Ω.

D.R. per N.M.=6063 Ω at sea temperature.

CONSTANT 30 volts through 10^5=267 S.R.=400=667·5 through 1 Ω.

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* CAPACITY TEST ON WATERVILLE END. CABLE FREE AT WATERVILLE STATION.

KELVIN'S "NULL" METHOD (USING K. & V.'S SLIDES).

1.35 A.M. (30 volts.)

Standard Condenser=30·2977 mfds. (K)

Slide Reading =8183·

$$* = K \frac{S.R.}{10000 - S.R.}$$

TOTAL CAPACITY=136·45 mfds.

NOTE.—The total capacity of the 3·348 N.M. spliced up in After Tank=1·3 mfds., therefore 136·45−1·3=135·15 mfds.=total capacity in circuit up to "BUCCANEER'S" WESTERN SPLICE.

TESTS *from Ship on* HAVRE *End* (*before making Final Splice, 5/2/02*).

10.18 A.M. Length in circuit { Ship to Bléville =75·595 N.M.
Bléville to Havre= 3·217 „
Total=78·812 „

(Cable Earthed at Havre).

CONDUCTOR RESISTANCE 18 cells. 1000 : 1000.

Zinc.	Carbon.	
1284	1268	Temperature Bridge Coils=54° F. O.K. at 60° F. (Platinoid).
1289	1268	
1288	1276	
1282	1270	
1287	1272	Mean total C. R. corrected=1277·5 ω.

CAPACITY 20 cells. CABLE FREE AT HAVRE.

KELVIN'S "NULL" METHOD (USING K. & V.'S SLIDES).

10.26 A.M.

Standard Condenser=20·2379 mfds.

Slide Reading =5525.

TOTAL CAPACITY OF CABLE=24·987 mfds.

D.R. 20 cells (30 volts). CABLE FREE AT HAVRE.

Mins.	Zinc.	Lead=nil S.R. 10000.
1 =	20	S.R. 10000 m.p.=1.
2 =	19	
3 =	18	D.R. total=33·37 Ω.
4 =	19	
5 =	18	D.R. per N.M.=2630 Ω at sea temperature.

CONSTANT 20 cells through 10^5=267 S.R. 400=667·5 through 1 Ω.

TESTS *from Ship on* WATERVILLE *End (before making Final Splice, 5/2/02).*

1.29 A.M. (End Earthed at Waterville).

CONDUCTOR RESISTANCE 20 cells. 10000 : 10000.

Zinc.	Carbon.
6802	7452
6815	7430
6800	7460
6800	7435

Length in circuit=436·09 N.M. approximate.
Temperature B.C.=52° F. Correct at 60° F. (Platinoid).

Total mean C.R. corrected for E. C.'s (Kempe's formula) and temperature of Bridge Coils=7111·6 ω.

This includes the resistance of 1·194 N.M. remaining in tank, which was cut off before splicing, viz., 19·2 ω. The resistance, therefore, of cable (Waterville side) to Havre buoyed end before splicing up=7111·6 ω − 19·2 ω = 7092·4 ω.

D.R. TEST (30 volts). END FREE AT WATERVILLE.

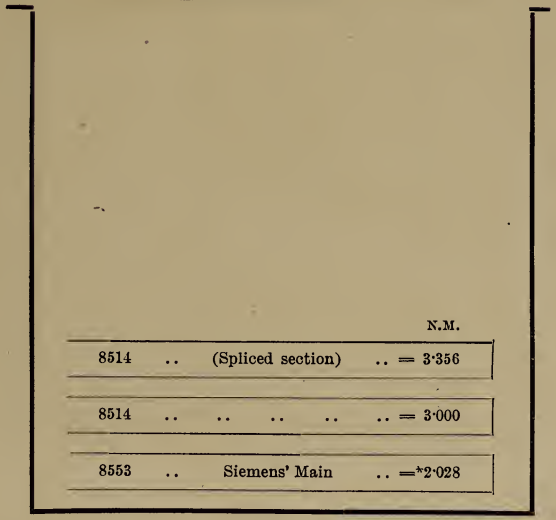
Mins.	Zinc.	Lead=nil S.R.=10000.
1	=	50−2 S.R.=10000 m.p.=1.
2	=	42
3	=	38
4	=	35
5	=	33

D.R. total=13·91 Ω.
D.R. per N.M.=6068 Ω at sea temperature.

CONSTANT 30 volts through 10^5=267 S.R.=400=667·5 through 1 Ω.

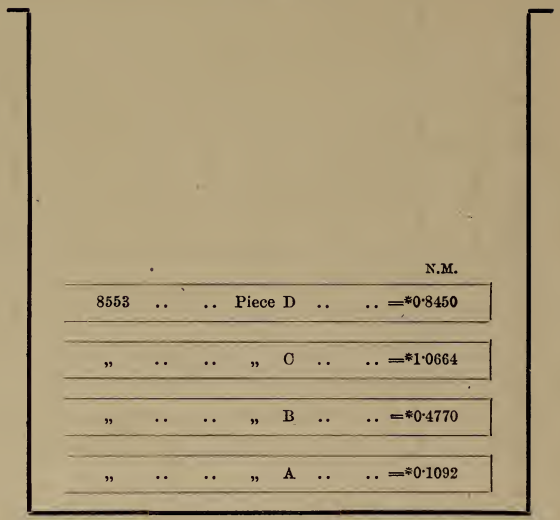
DISTRIBUTION OF CABLE IN TANKS ON BOARD THE S.S. "BUCCANEER," ON LEAVING THE THAMES, 30.1.02.

AFTER TANK.



* Electrical Length—determined by C.R.

FORE TANK.



* Indicator lengths.

FACTORY ELECTRICAL VALUES OF CABLE

On Board S.S. "Buccaneer," on Leaving the Thames, January 30th, 1902.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total per N.M.		Total per N.M.		Total per N.M.		
Siemens' 8553					FORE	TANK.				Top in Tank.
Piece D*	Plain	0·8450	0·85 3	11·294	13·22	0·2559	0·2995	—	—	Picked up, 17.1.02.
	Rib			11·337	13·27	0·2525	0·2956	—	—	
Piece C.*	Plain	1·0664	1·0781	14·253	13·22	0·3229	0·2995	—	—	Picked up, 16.1.02.
	Rib			14·307	13·27	0·3187	0·2956	—	—	
Piece B.*	Plain	0·4770	0·4832	6·375	13·22	0·1444	0·2995	—	—	Picked up, 15.1.02.
	Rib			6·400	13·27	0·1425	0·2956	—	—	
Piece A.*	Plain	0·1092	0·1104	1·4595	13·22	0·0331	0·2995	—	—	Picked up, 14.1.02.
	Rib			1·465	13·27	0·0326	0·2956	—	—	
										Bottom in Tank.
					AFTER	TANK.				
Siemens' 8514		3·356		57·723	17·2	1·195	0·356	113·8	382·	
„		3·000		49·80	16·60	1·074	0·358	100·7	302·	
Siemens' 8553	1	2·028	2·050	26·916	13·13	0·6773	0·3304	1166·	2390·	
	2			26·937	13·14	0·6747	0·3291	1432·	2935·	

* Picked up during Repairs to Weston—Waterville (1885) Cable, January, 1902.

DISTRIBUTION OF CABLE IN TANKS ON BOARD THE S.S. "BUCCANEER," AFTER COMPLETION OF REPAIRS, 5.2.02.

AFTER TANK.

			N.M.
8514	..	(Spliced section) ..	= 1·194
8514	.. ..		= 3·000
8553	..	Siemens' Main ..	=*2·028

Electrical Length—determined by C.R.

FORE TANK.

			* N.M.
8514	.. ..	Piece H	=0·165
„	.. ..	„ G	=0·145
„	.. ..	„ F	=0·076
„	.. ..	„ E	=0·082
8553	.. ..	„ D	=0·8450
„	.. ..	„ C	=1·0664
„	.. ..	„ B	=0·4770
„	.. ..	„ A	=0·1092

* Picked up cable—(Havre—Waterville and Weston—Waterville). Indicator lengths.

FACTORY ELECTRICAL VALUES OF CABLE

Remaining on Board S.S. "Buccaneer," After Completing Repairs, February 5th, 1902.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total per N.M.		Total per N.M.		Total per N.M.		
8514					FORE	TANK.				
Piece H.	Core 70/75	0·168		2·921	17·39	0·0519	0·3091	—	—	Top in Tank.
Piece G.	Core 70/75	0·145		2·521	17·39	0·0448	0·3091	—	—	Pieces E, F, G and H, were picked up during Repairs to the Havre—Waterville Section off Cherbourg, February, 1902. No use for relaying, mechanically bad.
Piece F.	Core 70/75	0·076		1·322	17·39	0·0235	0·3091	—	—	
Piece E.	Core 70 75	0 082		1·426	17·39	0·0253	0·3091	—	—	
8553										
Piece D.	Plain	0·8450	0·8543	11·294	13·22	0·2559	0·2995	—	—	
	Rib			11·337	13·27	3·2525	0·2956	—	—	
Piece C.	Plain	1·0664	1·0781	14·253	13·22	0·3229	0·2995	—	—	Pieces A to D were picked up during Repairs to Weston—Waterville 1885 Cable. All O.K., electrically and mechanically.
	Rib			14·307	13·27	0·3187	0·2956	—	—	
Piece B.	Plain	0 4770	0·4832	6·375	13·22	0·1444	0·2995	—	—	
	Rib			6·400	13·27	0·1425	0·2956	—	—	
Piece A.	Plain	0·1092	0·1104	1·4595	13·22	0·0331	0·2995	—	—	
	Rib			1·465	13·27	0·0326	0·2956	—	—	Bottom in Tank.
					AFTER	TANK.				
Siemens' 8514 Core 70/75		1·194	—	20·537	17·2	0·4251	0·356	319·9	382·	Top in Tank.
„ „		3·000	—	49·80	16·6	1·074	0·358	100·7	302·	
Siemens' 8553 Core 90/85	1	2·028	2·050	26·916	13·13	0·6773	0·3304	1166·	2390·	Bottom in Tank.
	2			26·937	13·14	0·6747	0·3291	1432·	2935·	

EXPENDITURE TABLE.

New Cable. Siemens' 8514.

	N.M.		N.M.
Received from Messrs. Siemens Bros. off Telegraph Works, Silvertown, 29.1.02	3·356 3·000	=	6·356
Laid in Havre—Waterville Section, 5.2.02	= 2·154		
Splice	= 0·008	= 2·162	
Remaining on board in "Buccaneer's" After Tank after completion of repairs, 5.2.02	=	4·194	= 6·356

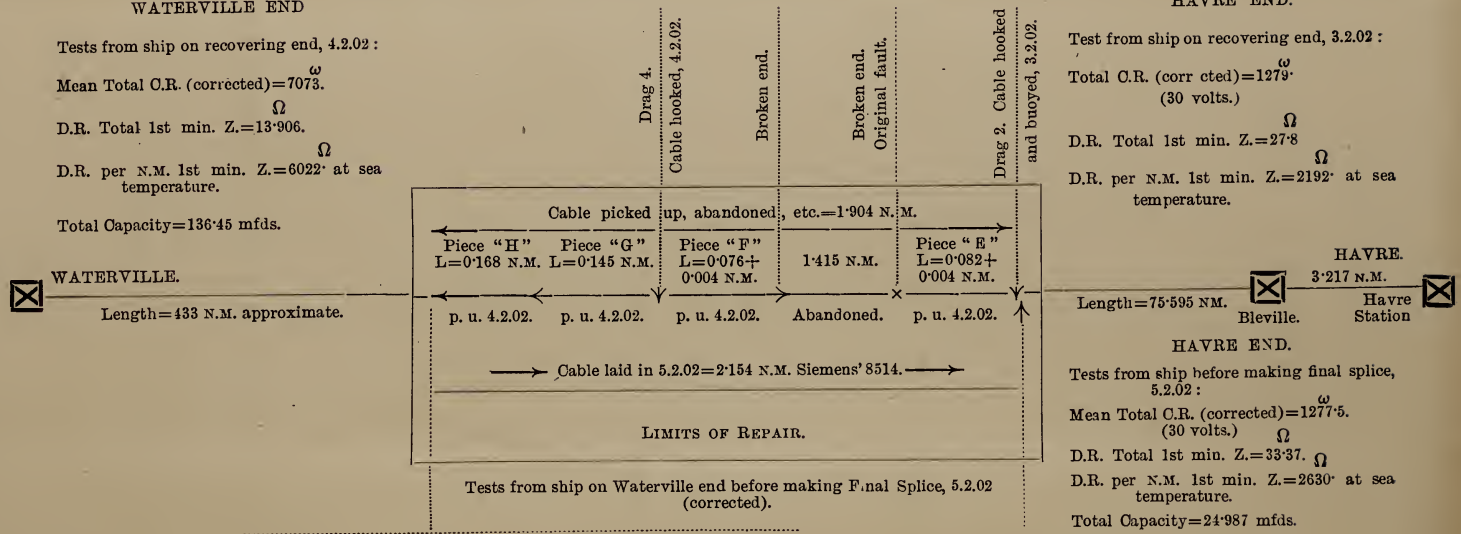
Old Cable.

		N.M.
Cable picked up, abandoned, etc., etc., during Havre—Waterville Repairs. Total		= 1·904
Coiled in "Buccaneer's" Fore Tank. Piece E	= 0·082	
" " " " F	= 0·076	
" " " " G	= 0·145	= 0·471
" " " " H	= 0·168	
Cut off for damaged ends, ·004 + ·004 + ·003	= 0·011	
Cut off for Splice	= 0·007	
Abandoned between Havre and Waterville Buoys	= 1·415	= 1·904

Increase in Length of Havre—Waterville Section.

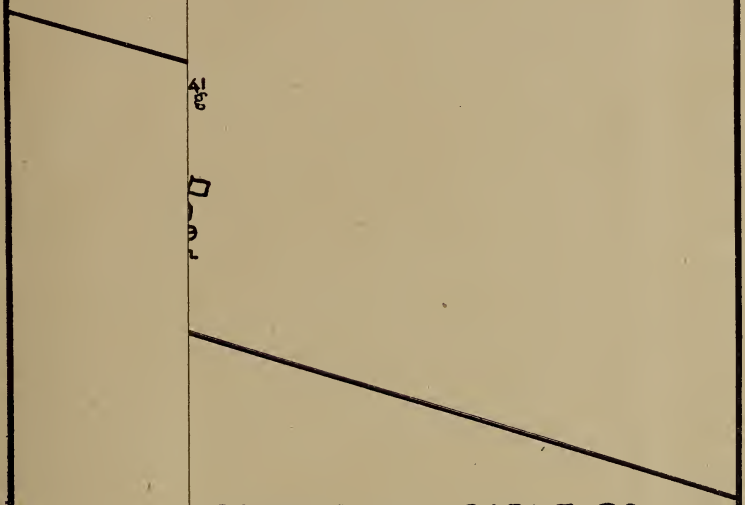
	N.M.
New Cable laid in Section	= 2·154
Cable picked up, abandoned, etc. ...	= 1·904
Increase in length	= 0·250

DIAGRAM OF REPAIRS BY THE S.S. "BUCCANEER." FEBRUARY, 1902.



NOTE.—The arrowheads denote the direction of picking up or laying.

* Including L.L. at Waterville.



COMMERCIAL CABLE Co.

HAVRE – WATERVILLE REPAIR

BY

"S.S. BUCCANEER"

FEB: 1902

NOTE

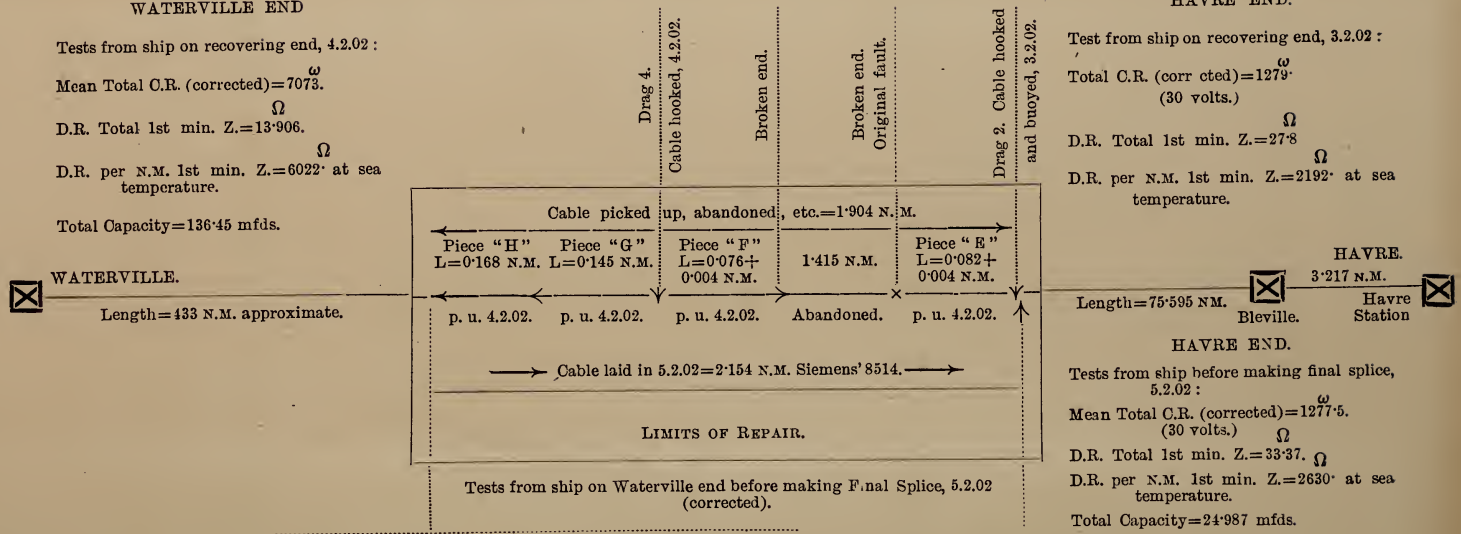
New Cable.
Cable picked up.
Do abandoned.
Original line of cable as given
All positions are from D.R. no sights obtainable.

SCALE

0 1 2

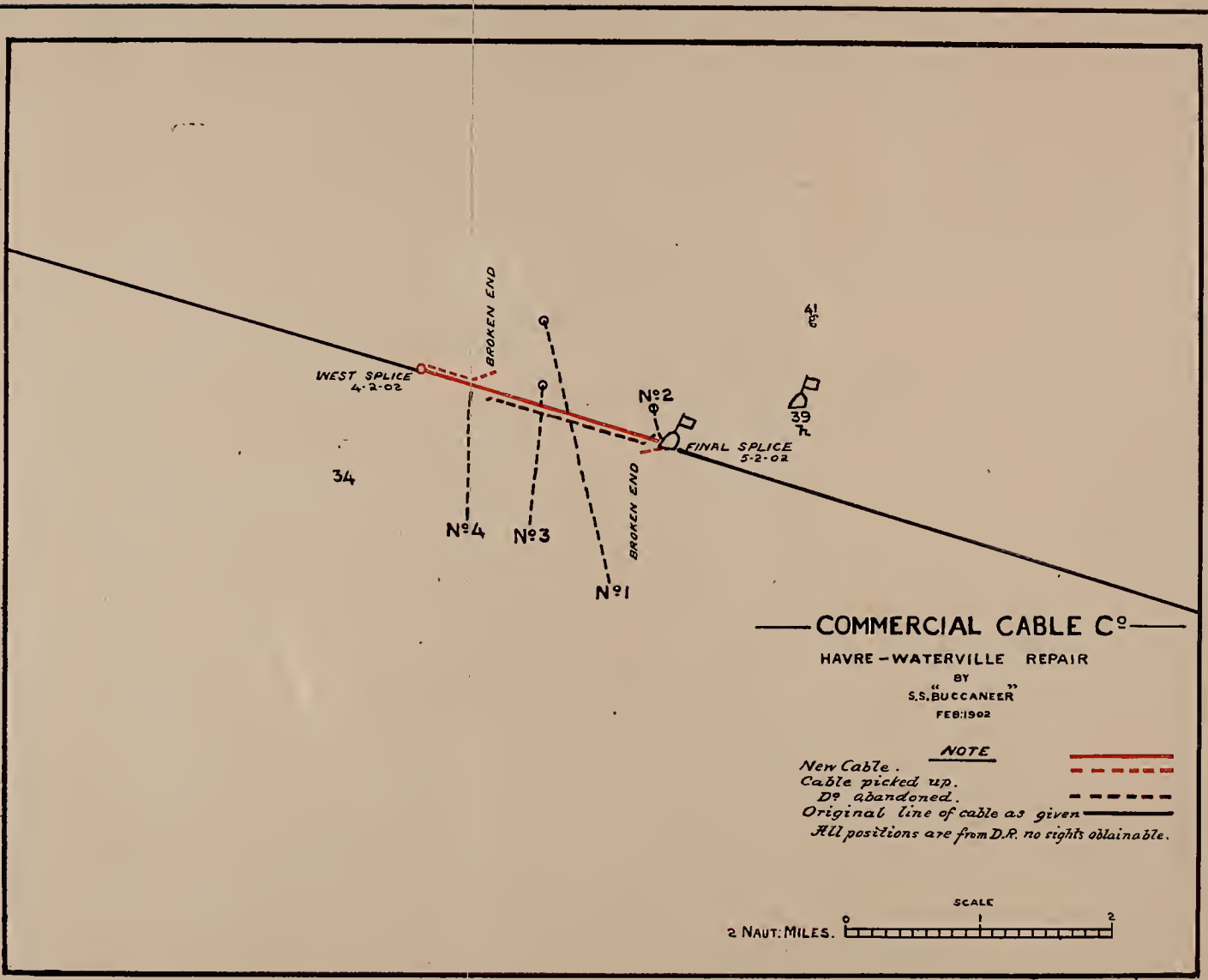
LES.

DIAGRAM OF REPAIRS BY THE S.S. "BUCCANEER." FEBRUARY, 1902.



NOTE.—The arrowheads denote the direction of picking up or laying.

* Including L.L. at Waterville.



BROKEN END
WEST SPLICE
4-2-02
Nº2
FINAL SPLICE
5-2-02
39
34
Nº4
Nº3
Nº1
BROKEN END
COMMERCIAL CABLE Cº
HAVRE – WATERVILLE REPAIR
BY
S.S. "BUCCANEER"
FEB:1902
NOTE
New Cable.
Cable picked up.
Dº abandoned.
Original line of cable as given
All positions are from D.R. no sights obtainable.
SCALE
2 NAUT: MILES.
0
1
2

WESTON—WATERVILLE (1885) CABLE REPAIR EXPEDITION.

JULY, 1902.

REPAIR

TO THE

Weston—Waterville (1885) Cable.

S.S. "BUCCANEER."

JULY, 1902.

o 2*a*

GENERAL INDEX.

Weston—Waterville (1885) Cable Repair Expedition, July, 1902.

S.S. "BUCCANEER."

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GENERAL REPORT.

GENERAL REPORT.

S.S. "Buccaneer,"
August 11*th*, 1902.

M. H. Gray, Esq.,
Silvertown.

Dear Sir,

On July 19th the S.S. "Buccaneer" was chartered by the Commercial Cable Company to repair the above cable, the position of fault being approximately 149 n.m. from Waterville and 182 n.m. from Weston.

The ship left Silvertown at 3.25 p.m. on the 21st ult., Mr. Gott, of the Commercial Cable Company, having joined her. We arrived on the cableground on the morning of the 23rd and got the cable in 55 fms. on the first drag. Tests showed the cable to be all right to Waterville, and a high resistance fault to be in the "plain" core about 3 n.m. from the ship on the Weston end.

After 3·115 n.m. cable was picked up and cable cut, the fault was found to be inboard and tests to Weston were "O.K." A further length of 0·387 n.m. was picked up to ascertain condition of cable. This proving to be satisfactory, it was afterwards paid out with type No. 8553 from the after tank, and the final splice slipped at 4.50 p.m. on the 24th.

The cable cut out during the repair was 3·115 n.m., and new cable laid in 3·268 n.m., making increase in section of 0·153 n.m.

On the homeward voyage the fault was localised and cut out of the picked up cable and found to be at a yellowish patch, about half an inch long and extending half way around the core, which at this place was very sticky. The cable at this point was mechanically

good, and no reason could be assigned for the discolouration of the gutta, the only surmise being that it was caused by some foreign substance when as core in the factory.

The S.S. "Buccaneer" arrived and was moored off Silvertown at 0.30 p.m., Saturday, July 26th.

Herewith I enclose copy of Engineer's Log and Electrical Report for the Expedition.

I am, dear Sir,

Yours faithfully,

F. C. CRAWFORD.

LIST OF STAFF, OFFICERS, CABLE HANDS & CREW.

Mr. F. C. Crawford,	Engineer in Charge.
,, H. E. Cann,	Electrician.
,, E. H. Walker,	Accountant.
,, T. W. Sharp,	Master.
,, J. S. Roberts,	Chief Officer.
,, V. Jones,	2nd ,,
,, H. A. Rowe,	3rd ,,
W. Mackenzie,	Carpenter.
J. Kelly,	Boatswain.
J. Dickens,	Boatswain's Mate.
4 Quartermasters.	
6 Able Seamen.	
1 Deck Boy.	
1 Lamptrimmer.	
Mr. A. White,	Chief Engineer.
,, W. McFarlane,	2nd ,,
,, J. Cadman,	3rd ,,
,, W. Howat,	4th ,,
J. Maguire,	Donkeyman.
6 Firemen.	
3 Trimmers.	
Mr. A. Patrick,	Chief Steward.
1 2nd Steward.	
1 Chief Cook.	
1 2nd Cook.	
1 Pantryman.	
2 Assistant Stewards.	
1 Engineers' Steward.	
1 Scullion.	

CABLE HANDS.

W. C. Tillyer,	Cable Foreman.
B. Butcher,	Leading Hand.
C. J. Cakebread,	Cable Hand.
W. Mack,	,, ,,
A. Armes,	,, ,,
G. Armes,	,, ,,
W. Gallant,	,, ,,
H. Breach,	,, ,,
H. Hills,	Fitter.
A. E. Newton,	Fitter's Mate.
R. Welsh,	Jointer.

SUMMARY.

Staff	3
Officers and Crew	42
Cable Hands	11
Mr. Gott, C. C. Co.'s Representative	1
Total on board on leaving London	57

DISTRIBUTION OF WEIGHT IN SHIP ON LEAVING GRAVESEND.

	TONS.
Cable in fore tank	—
,, ,, after ,, ...	35·35
Coal in bunkers	140·00
Fresh water in after fresh water tank	13·00
,, ,, ,, cone	8·00
,, ,, ,, side tanks	4·50
Water in ballast tanks forward	70·00
,, ,, ,, aft	15·00
Boatswain's stores forward	2·25
Carpenter's ,, ,, ...	·25
Cable stores and buoys	9·00
Engine-room stores	2·00
Water in main boiler	28·00
Steward's stores	5·50
Extra chain cable	1·00
Spare anchors, ropes, etc.	2·00
,, propeller	3·00
Deck machinery	10·00
TOTAL = 348·85 tons	

Draught { Fore 11′ 0″ / Aft 13′ 9″ Mean 12′ 4½″

COMMERCIAL CABLE COMPANY'S WESTON—WATERVILLE (1885) CABLE REPAIR.
S.S. "BUCCANEER," JULY, 1902.

DISTRIBUTION OF CABLE IN SHIP AND WEIGHT ON LEAVING GRAVESEND.

FORE TANK.

EMPTY.

AFTER TANK.

Factory No.	Core.	Length. N.M.		Weight. Tons.
8553	Twin	2·3615 picked up		15·00
„	„	2·0190 new		
8514	Single	3·9070		20·35
		8·2875	=	35 35

COMMERCIAL CABLE COMPANY'S WESTON—WATERVILLE (1885) CABLE REPAIR.

S.S. "BUCCANEER," JULY, 1902.

CONSTANTS FOR PICKING UP AND PAYING OUT DRUM.

Circ. of Drum = 17′ $2\frac{1}{2}$″

Type.	Circ. in inches.	Revs. per N.M.	Log.	Fms. per Rev.
1 Core (old) 8514	4·250	346·590	2·5398169	2·927
1 Core (new) 8514	4·375	346·385	2·5395594	2·929
2 Core 8553	3·465	347·886	2·5414375	2·916
Grappling Rope :				
4 × 6 (old)	4·646	345·940	2·5390016	2·932
Buoy Rope, Steel Manilla :				
4 × 4 (new) ...	3·860	347·233	2·5406213	2·922
3 × 3 „ ...	2·700	349·159	2·5430228	2·905
2 Core, picked up, 8552 ...	3·387	348·016	2·5415988	2·915

MECHANICAL DESCRIPTION OF CABLE.

Siemens' L.I. Cable, their Factory No. 8553.

Conductor :—Solid plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs. per N.M.

Two Cores as above, one marked with "Rib," the other "Plain," laid up, wormed and served with tanned jute yarn.

Sheathing :—15 G. Homo. wires, No. 9 L.S.G. = ″·144 dia. when galvanized.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1″·103.

Weight in air, dry = 3·293 tons per N.M.

,, ,, wet = 3·420 ,, ,,

,, in sea water = 2·241 ,, ,,

Siemens' H.I. Cable, their Factory No. 8514.

Conductor :—Strand of 7 copper wires, ″·023, weighing 70 lbs. per N.M.

Dielectric :—Gutta percha, ″·205, weighing 75 lbs. per N.M.

Serving :—Tanned jute yarn.

Sheathing :—10 B.B.G.I. wires, ″·238 dia. when galvanized.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1″·393.

Weight in air, dry = 5·437 tons per N.M.

,, ,, wet = 5·526 ,, ,,

,, in sea water = 3·873 ,, ,,

Above particulars taken from samples.

Siemens' Int. Cable, their Factory No. 8552 (Twin).

Couductor :—Solid plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs. per N.M.

Two Cores wormed and served with tanned jute yarn.

Sheathing : 17 G. Homo wires, ″·124 dia.

Outer Serving : Two coats jute yarn prepared in compound, alternating with three coats compound.

Ex. diameter = 1″·078.

Weight in air, dry = 2·838 tons. From sample.

,, ,, wet = 2·900 ,, ,,

,, in sea water = 1·798 ,, ,,

Breaking strain = 11·5 tons.

Above particulars taken from sample.

WESTON—WATERVILLE (1885) CABLE REPAIR EXPEDITION.

JULY, 1902.

ENGINEER'S GENERAL DIARY.

S.S. "BUCCANEER."

STEAMING DOWN RIVER, *EN ROUTE* FOR POSITION TO GRAPPLE.

S.S. "BUCCANEER."

HOUR.	
	MONDAY, JULY 21st (1st DAY OUT).
P.M. 0.35	Messrs. Gott, Crawford and Walker joined ship at Silvertown.
1.0	Six Firemen joined ship.
3.25	Slipped moorings and proceeded down river. Pilot Twist in charge.
4.0	Off Gravesend. Stopped ship. Pilot Twist left and Pilot Letten boarded.
4.5	Proceeded down river.
5.26	Nore Light Vessel abeam.
8.21	Gull ,, ,, ,,
9.15	Off Dover. Stopped ship and discharged Pilot Letten.
11.15	Dungeness abeam.
MID.	Moderate NW wind. Cloudy. Bar. 29·95. Ther. 58° F.
	TUESDAY, JULY 22nd (2nd DAY OUT).
A.M. 1.28	Royal Sovereign Light abeam, 1 N.M. distant.
2.12	Beachy Head ,, ,, 3·75 N.M. ,,
4.0	Light W breeze. Smooth sea. Cloudy, fine. Bar. 30·02. Ther. 69° F.
5.5	Owers Light Vessel abeam, 4 N.M. distant.
7.35	St. Catherine's Lighthouse abeam, 8 N.M. distant
8.0	Moderate W wind and sea. Cloudy and overcast. Bar. 30·03. Ther. 66° F.

HOUR.	TUESDAY, JULY 22nd (2nd DAY OUT)—*Contd.*
NOON	Moderate SW wind. Dull, cloudy weather. Bar. 30·00. Ther. 65° F. Portland Bill, N 31° W / Anvil Point, N 28° E — Lat. 50° 19′ N. Lon. 2° 11′ W. Distance run since leaving Gravesend = 211 N.M.
P.M. 4.0	Fresh W by S wind and cloudy. Occasional showers. Bar. 29·99. Ther. 64° F.
5.23	Start Lighthouse abeam, 7 N.M. distant.
8.0	Fresh W wind and overcast. Less sea. Bar. 30·02. Ther. 62° F. Eddystone Lighthouse abeam, 7 N.M. distant.
11.30	Lizard Lighthouse abeam, 6 N.M. distant.
MID.	Moderate WNW wind. Dull, cloudy weather. Bar. 29·98. Ther. 63° F.
	WEDNESDAY, JULY 23rd, (3rd DAY OUT).
A.M. 1.34	Wolf Lighthouse abeam, 7 N.M. distant.
4.0	Bishop ,, ,, 5 N.M. ,, Fresh WNW breeze. Cloudy and fine. Bar. 30·00. Ther. 68° F.
8.0	Light NW wind and cloudy. Bar. 29·97. Ther. 63° F.
11.30	Stopped ship and sounded No. 1—56 fms., sand.
11.40	In position to place Mark Buoy. Paid out moorings and streamed Buoy No. 43 "J." Position { Lat. 50° 51′·6. Lon. 7° 32′·2. *Buoy's Moorings.*—15 fms. 4 × 4 side rope, 2·20 and 2·10 fm. lengths $\frac{5}{8}$″ chain, mushroom = 4 cwt.
NOON.	Dodging ship round buoy, awaiting to check position of same. Light NW wind. Fine and clear. Bar. 30·00. Ther. 75° F.
P.M. 2.7	Lowered boat and sent her away to dismantle Mark Buoy, it being 4 miles S of position.

HOUR.	WEDNESDAY, JULY 23rd (3rd DAY OUT)—*Contd.*
P.M.	
2.15	Knocked up tumbler and commenced picking up buoy's moorings. Hove up buoy and boat.
2.27	All moorings on board. Set on for new position to place Mark Buoy.
3.0	Stopped ship and sounded No 2—55 fms., sand.
3.5	Sounded No. 3—55 fms., sand.
	On Cableground.
3.10	In position. Commenced paying out buoy's moorings.
3.20	All moorings paid out. Slipped Mark Buoy, "J," with same moorings as before. Position { Lat. 50° 53′·5. Lon. 7° 38′·5.
3.25	Lowered boat and sent her to put lamps on buoy.
3.40	Boat returned to ship and was hoisted.
4.0	Light NW wind and fine weather. Bar. 30·00. Ther. 70° F.
	Drag No. 1.
	Lowered ordinary grapnel, with 10 fms. $\frac{7}{8}$″ chain, and commenced paying out 4 × 4 rope.
4.5	Paid out to 100 fms. of rope and chain.
4.30	No strain. Engines moved as required.
5.0	,, ,,
5.30	,, ,,
6.0	,, ,,
6.35	Strain steadily rose, commenced to pick up.
6.50	Grapnel at bows with cable. Got drum ropes along and secured to each side of cable.
7.5	Cut cable, hove grapnel inboard, and took grappling chain off drum.

HOUR.	WEDNESDAY, JULY 23rd (3rd DAY OUT)—*Contd.*
P.M. 7.15	Took drum rope attached to Waterville end to drum and commenced heaving in.
7.35	Enough cable abaft drum for testing. Commenced testing to Waterville.
	Cable—Type No. 8552, $\frac{20}{85}$ core. Sheathing=17 wires, 0″·124 dia.
8.0	Light NW wind. Fine weather.
	Bar. 30·00. Ther. 70° F.
8.12	Finished testing. Tests showed cable to be "O.K." to Waterville.
8.20	Sealed Waterville end, and prepared to buoy same.
8.25	Commenced paying out buoy's moorings.
8.35	Decided to hang on to Waterville end until Weston end was tested.
8.40	Veered away on Waterville end and picked up on Weston end.
9.14	Weston end abaft drum. Commenced testing.
10.30	Finished testing. Tests showed fault to be about three miles outboard.
10.45	Sounded No. 4[T]—54 fms. Temp. 50·5° F.
10.50	Veered away on Weston end and picked up on Waterville end to fix buoy's moorings afresh.
11.5	Commenced paying out moorings attached to Waterville end.
11.25	All moorings out. Slipped buoy No. 42.
	Position { Lat. 50° 52′·2 N. / Lon. 7° 34′·7 W.
	Buoy's Moorings.—$\frac{5}{8}$″ bridle, 15 fms. 4×4 side rope, 7·10 fm. lengths $\frac{5}{8}$″ chain, $2\frac{1}{2}$ fms. $\frac{5}{8}$″ mushroom chain, mushroom=4 cwt.
11.27	Took drum rope attached to Weston end to drum and commenced picking up to fault.

HOUR.	
	WEDNESDAY, JULY 23rd (3rd DAY OUT)—*Contd.*
P.M. 11.30	End of cable off drum. Set Ind. 0. Coiling cable into No. 1 tank.
MID.	Mod. W wind. Fine clear weather. Bar. 29·97. Ther. 76° F.
	THURSDAY, JULY 24th (4th DAY OUT).
A.M. 0.10	0·50 N.M. of cable picked up. Cable in good mechanical condidion.
0.32	1·00 N.M. of cable picked up. Cable in good mechanical condition.
1.0	1·50 N.M. of cable picked up. Cable in good mechanical condition.
1.22	2·00 N.M. of cable picked up. Cable in good mechanical condition.
1.45	2·50 N.M. of cable picked up. Cable in good mechanical condition.
2.6	3·00 N.M. of cable picked up. Cable in good mechanical condition.
2.10	Ind. = 1084 revs. = 3·115 N.M. of cable picked up and coiled in fore tank. Cut cable at this length in fore tank and found fault in the piece in tank. Tests on cable outboard to Weston satisfactory. Continued picking up on cable very slowly, coiling cable on deck.
3.15	Ind. = 1218 revs. = 3·502 N.M. total cable picked up on Weston end less 3·115 N.M. = 0·387 N.M. on Weston end on deck.
3.25	Lowered 4 cwt. mushroom with 100 fms. of drum rope, to act as moorings during making of splice.
3.35	Got up top end of cable, Type 8553, from after tank and opened out to splice on to Weston end.
4.0	Mod. NW breeze and clear. Bar. 29·96. Ther. 64° F.
4.44	Commenced joint, Cut 7 fms. off after tank end.
6.50	Finished joint.

HOUR. A.M.	THURSDAY, JULY 24th (4th DAY OUT).—*Contd.*
7.0	Commenced splice.
8.0	Finished splice. Light WNW breeze and fine. Bar. 29·94. Ther. 64° F.
9.30	Commenced picking up mushroom, mooring ship.
9.50	Mushroom up. Set on "Slow" ahead, paying out cable (Type No. 8553), from after tank, to Waterville buoyed end. Put engine out of gear.
9.55	Splice between cable in after tank=Pt. Piece "C," and Weston end passed off drum. Ind.=134 revs=0·387 N.M. of cable paid out.
	Position of splice { Lat. 50° 52′·4. Lon. 7° 29′·5.
10.4	Splice in cable, Type 8553, between Pt. Piece "C" and Pt. Piece "C" in after tank passed outboard. 0·277 N.M. cable from after tank laid.
10.7	Ind.=348 revs.=1·000 N.M. of cable paid out, less 0·387 N.M.=0·613 N.M. of cable laid in from after tank.
10.10	Splice in type No. 8553 from after tank between Part Piece "C" and Piece "A" passed out board. Ind.=480 revs.=1·382 N.M. of cable laid−0·387 N.M.=0·995 N.M. of new cable laid in from after tank.
10.14	Splice in type No. 8553 from after tank between Piece "A" and Piece "B" passed out board. Ind.=502 revs.= 1·445 N.M. of cable laid−0·387 N.M.=1·058 N.M. of cable laid in from after tank.
10.22	Splice in type No. 8553 from after tank between Piece "B" and Piece "D" passed out board. Ind.=655 revs.= 1·885 N.M. of cable laid−0·387 N.M.=1·498 N.M. of cable laid in from after tank.
10.23	Ind.=696 revs.=2·000 N.M. of cable laid−0·387 N.M.= 1·613 N.M. of cable laid in from after tank.
10.36	Splice in Type No. 8553 from after tank between Piece "D" and New Type No. 8553 passed outboard. Ind.= 944 revs.=2·716 N.M. of cable laid−0·387 N.M.=2·329 N.M. of cable laid in from after tank.

HOUR.	THURSDAY, JULY 24th (4th DAY OUT)—*Contd.*
A.M. 10.41	Ind. = 1044 revs. = 3·000 N.M. of cable laid − 0·387 N.M. = 2·613 N.M. of cable laid in from after tank.
11.0	Ind. = 1254 revs. = 3·607 N.M. of cable laid − 0·387 N.M. = 3·220 N.M. of new cable laid in from after tank. Stopped ship and put brakes down, and put engine in gear, approaching buoy on Waterville end.
11.5	Lowered boat and sent her away with drum rope to dismantle buoy on Waterville end.
11.7	Took turns of cable off drum, and took drum rope attached to buoy's moorings to and commenced picking up.
	Ind. = 1254 revs. = 3·607 N.M. when cable was taken off drum.
11.25	Veered away 36 fms. of cable.
11.40	All moorings on board, and enough Waterville end abaft drum for splice; put hanging ropes, stoppers, and rounding on.
NOON.	Light WNW wind. Fine and clear weather. Bar. 29·92. Ther. 75° F.
P.M. 0.12	Commenced testing to Waterville.
0.20	Cut Weston end (tank end).
	Length paid out by Indicator.
	Total cable paid out from after tank = 3·220 N.M. + ·036 N.M. veered away + ·012 cut off for splices = 3·268 N.M.
0.25	Sounded No. 5T—54 fms. Temp. 50° F.
0.45	Finished testing Waterville end, "O.K." Commenced testing Weston end from cut.
1.25	Finished testing Weston end, "O.K." Commenced opening out end for joint and preparing for splice.
2.0	Commenced joints. Cut 5 fms. off Weston end (tank end).
3.30	Finished joints.
3.45	Commenced splice.

HOUR.	
P.M.	THURSDAY, JULY 24th (4th DAY OUT)—*Contd.*
	SLIPPING FINAL SPLICE AND HOMEWARD BOUND.
4.50	Finished splice.
4.55	Veered away on hanging ropes.
5.0	Cut hanging ropes, letting go the final splice, thus completing the Repair to the Weston—Waterville (1885) Cable.
	Position { Lat. 50° 52′·2. Lon. 7° 34′·7.
	Set on to pick up Mark Buoy "J."
5.25	Up to buoy. Lowered boat, and sent her away with drum rope to dismantle same.
5.45	Knocked up tumbler and commenced heaving up moorings.
5.50	Hove up buoy and boat.
5.57	All moorings on board. Set on "full ahead" for London.
8.0	Light W wind. Fine and clear weather. Bar. 29·92. Ther. 63° F.
11.0	Observed Sendeen and Round Island lights.
MID.	Light variable wind. Fine and clear. Bar. 29·90. Ther. 66° F.
	FRIDAY, JULY 25th (5th DAY OUT).
A.M.	
0.38	Round Island Light abeam.
1.56	Longships Light abeam, 6 N.M. distant.
4.0	Light WNW wind. Cloudy and overcast. Bar. 29·92. Ther. 68° F.
4.50	Lizard Point abeam, 4 N.M. distant. Signalled number.

HOUR.	FRIDAY, JULY 25th (5th DAY OUT)—*Contd.*
A.M.	STEAMING UP CHANNEL.
8.0	Light SW Wind. Cloudy and overcast. Bar. 29·94. Ther. 65° F.
8.6	Eddystone Lighthouse abeam, 7·5 N.M. distant.
10.4	Start Point abeam, 4·5 N.M. distant.
NOON.	Light S wind. Cloudy and overcast. Bar. 29·92. Ther. 67° F.
	Distance run = 195 N.M. from Mark Buoy.
P.M.	
2.5	Portland Lighthouse abeam.
4.0	Light SSE wind. Cloudy and overcast. Bar. 29·92. Ther. 64° F.
8.0	Mod. ESE wind. Overcast and raining. Bar. 29·91. Ther. 64° F.
11.50	Beachy Head abeam, 4·5 N.M. distant.
MID.	Mod. ESE wind. Overcast and raining. Bar. 29·87. Ther. 64° F.
	SATURDAY, JULY 26th (6th DAY OUT).
A.M.	
0.33	Royal Sovereign Light Vessel abeam, 2 N.M. distant.
2.30	Reduced speed off Dungeness.
3.0	Stopped ship. Pilot boarded. Proceeded again.
4.0	Light SSE wind. Overcast and occasional showers. Bar. 29·72. Ther. 68° F.
4.10	Signalled to Dover.
5.50	Passed North Foreland.
8.0	Fresh SW breeze. Cloudy and showery. Bar. 29·68. Ther. 66° F.
8.50	Passed Nore Light Ship.
10.55	Stopped off Gravesend. Discharged Channel Pilot and took River Pilot Letten.

HOUR.

A.M.

11.10 — Set on full ahead for moorings at Silvertown.

NOON. — Strong SW wind. Fine and clear.
Distance run since Noon yesterday = 243 N.M.

P.M.

0.30 — Arrived off Silvertown and made ship fast to buoys.

SATURDAY, JULY 26th (6th DAY OUT).—*Contd.*

During the morning tests were made on the 3·115 N.M. piece of cable in fore tank picked up on Weston end, and the fault was localized at 2·855 N.M. from bottom end of tank. The fault was cut out and handed to Mr. Gott; 0·040 N.M. was expended in removing the damaged portion, thus reducing the length to 3·075 N.M., in four pieces.

These pieces were spliced up July 31st as below:

	Original Length.	Cut off for Splices.	Present Length.
Piece 1 ...	2·715 N.M.	0·007 N.M.	2·708 N.M.
,, 2 ...	0·250 ,,	0·007 ,,	0·243 ,,
,, 3 ...	0·060 ,,	0·007 ,,	0·053 ,,
,, 4 ...	0·050 ,,	—	0·050 ,,
	3·075 N.M.	0·021 N.M.	3·054 N.M.

COMMERCIAL CABLE COMPANY'S WESTON—WATERVILLE (1885) CABLE REPAIR.
S.S. "BUCCANEER," JULY, 1902.

DISTRIBUTION OF CABLE IN SHIP AND WEIGHT ON ARRIVAL AT GRAVESEND.

AFTER TANK.

Factory No.		Core.		Length. N.M.		Tons.
8553	...	Twin	...	1·085	...	3·71
8514	...	Single	...	0·915	...	20·35
„	...	„	...	2·992		

FORE TANK.

Factory No.		Piece.		Core.		Length. N.M.		Tons.
8552	...	4	...	Twin	...	0·050	...	0·14
„	...	3	...	„	...	0·060	...	0·17
„	...	2	...	„	...	0·250	...	0·72
„	...	1	...	„	...	2·715	...	7·87

TOTAL CABLE ON BOARD.

Fore Tank	...	...	3·075 N.M.	=	8·90 Tons.
After Tank	...	...	4·992 „	=	24·06 „
			8·067 „	=	32·96 „

COMMERCIAL CABLE COMPANY'S

WESTON—WATERVILLE (1885) CABLE REPAIR.

S.S. "BUCCANEER," JULY, 1902.

DISTRIBUTION OF WEIGHT IN SHIP ON ARRIVAL AT GRAVESEND.

	Tons.
Cable in fore tank	8·90
,, after ,, ...	24·06
Coal in bunkers	70·00
Fresh water in after fresh water tank	2·00
,, ,, cones	—
,, ,, side tank	—
Water in ballast tanks—forward	70·00
,, ,, aft	15·00
Boatswain's stores—forward	2·00
Carpenter's ,, ...	·20
Cable stores and buoys	8·50
Engine room stores	1·50
Water in main boilers	28·00
Steward's stores	·50
Extra chain cable	1·00
Spare anchors, ropes, etc.	2·00
,, propeller	3·00
Deck machinery	10·00
Total ...	246·66 tons

ELECTRICAL REPORT.

WESTON—WATERVILLE (1885) CABLE REPAIR.

JULY, 1902.

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ELECTRICAL REPORT.

ELECTRICAL REPORT.

F. C. Crawford, Esq.,
Engineer in Charge.
S.S. "Buccaneer."

August 11th, 1902.

Dear Sir,

The object of this Expedition was the removal of a high resistance fault which existed in the Plain core of the above-mentioned cable, and which had been located from Weston at 149 N.M. from Waterville, and 182 N.M. approx. from Weston.

On July 21st, 3.25 p.m.—Mr. Gott, Electrician in Chief to the Commercial Cable Company, and Staff having joined ship shortly after noon—the "Buccaneer" cast off her moorings and proceeded down river, arriving off Dover at 9.15 p.m. same night, where the Channel Pilot was discharged. After a fine passage down Channel the ship arrived on the cableground (Lat. 50° 53′ N, Lon. 7° 35′ W) at 11.30, p.m. and July 23rd sounded in 56 fms., let go Mark Buoy and stood by to verify position by p.m. sights. At 1 p.m. finding the Mark Buoy out of position, it was taken on board, and ship set on to take up new position. At 3 p.m. sounded in 55 fms., and at 3.20 let go Mark Buoy, lowering grapnel at 3.52, and commenced Drag 1, the cable being hooked and brought to bows at 6.50 p.m. Waterville end was handed to Testing Room at 7.30 p.m., and called on Morse instrument, ship receiving an immediate reply.

Tests were then taken from the ship on Weston end, and gave the following results:

D.R. (30 volts). Length in circuit = 149·5 N.M.

Plain core, 1st min., Zinc total = $52 \cdot 274 \overset{\Omega}{=} 7815$ per N.M. at sea temperature.

Rib core, 1st min., Zinc total = 41·072 = 6140 Ω per N.M. at sea temperature.

C.R.

Resistance of looped cores = 3797 ω corrected { Plain core = 1901·49. Rib ,, = 1895·51.

C.R. at 75° (from Factory values) Plain core = 1995·5 ω. Rib = 1989·365 ω. Calculated temperature = 52° F.

(*For full tests on this and subsequent tests see Appendix.*)

Tests on Waterville side being satisfactory, the following S.G. was sent—8.7 p.m. Gott to V.P. and M.E., "Wednesday, 8 p.m. Cut in 7 p.m. 'O.K.' to Waterville. Now buoy that end and pick up to fault on Weston side. Weather fine."

The cores of Waterville end were then sealed, and cable veered away in order to pick up on Weston end.

At 9.14 p.m., called Weston on Morse, and instructed him to "loop" cores. A loop test was then taken (Varley's) from ship in order to locate fault in Plain core. The fault proved to be very variable, and of high resistance. The results of several tests were as follows:

The two lowest results gave distance to fault = 37·18 ω, which divided by 12·74 ω the C.R. per N.M. (mean) = 2·918 N.M. from ship. The *mean* of tests = 38·88 ω ÷ 12·74 ω = 3·052 N.M. from ship.

NOTE.—The C.R. of looped cores (corrected) = 4635·1 ω

{ Plain core = 2316·85 ω. Rib ,, = 2318·25.

Weston was then instructed to take a loop test as an additional check against ship's figures—the ends being looped on board, and at 10.25 p.m. ship received shore's results. "Added resistance to plain to balance = 70 ohms." = 2·75 N.M. approx. = distance from ship to fault.

NOTE.—The C.R. of "looped" cores by Weston's test = 4640 ω corrected.

At 11.25 p.m., July 23rd, slipped buoy No. 42 Red "B" attached to Waterville end and commenced picking up towards fault on Weston end, coiling down in fore tank. During the process of picking up, a control test was maintained, in the hope that when the fault was disturbed on the bottom or at the time of leaving the water, certain indications would be noticed on the galvanometer, but owing, doubtless, to the high resistance of the fault, no marked changes were observed, in fact, nothing which justified cutting the cable before the full length indicated by the loop test had been recovered. The resistance of fault during picking up varied from ·958 Ω, ·166 Ω to 1·87, falling at one time to 71560 units. Picking up was continued until 2.10 a.m. (July 24th), when current was taken off to cut cable. Length picked up = 3·115 N.M. by ship's indicator.

Tested and found fault inboard.

At 2.40 a.m., *Weston* was instructed to free both cores for 15 minutes, and a D.R. test, taken with 30 volts, gave the following result:

Plain Core 1st min. Zinc total = 27·381 Ω = 4884 per N.M.
Rib ,, ,, ,, = 30·264 Ω = 5398 ,,

Length in circuit = 178·33 N.M. each core.

The cores were then looped for ship's C.R. test.

C.R. of loop, corrected = 4562·2 ω { Plain core = 2280·4 ω
Rib ,, = 2281·8

(*For full tests see Appendix.*)

The cable in after tank, Type 8553, was then tested, the D.R. with 300 volts, and the tests being highly satisfactory (see Appendix) the end was given out to prepare for splicing. The following S.G. was then forwarded to Weston at 4.5 a.m.—"Gott to V. P. and M. E. Thursday, 4 a.m. Have taken out fault and now splicing on; about three miles to pay out. Weather fine."

At 4.45 a.m., commenced jointing cores of after tank cable to Weston end, the same being finished at 6.50 a.m., the joints and all

bare core on each side of joints being brass taped. The splice was finished and compounded by 8 a.m.

7 fms. cut off tank end for splice.

Immediately the splice was finished, Weston was instructed to free both cores for 15 minutes, and tests were then made from ship for capacity.

Capacity from ship to Weston by Kelvin's Null Method:

Plain Core = 55·830 mfds.
Rib ,, = 55·235 mfds.*
Spliced up, viz. { Plain = 1·390 mfds. / Rib = 1·378 ,,

At 8.30 a.m. (July 24th), received the following message from Weston, *re* Waterville's tests on sealed and buoyed end. "Here Waterville's results—Insulation 10th minute, Plain Z. = 82·48, C. = 56·48. Rib Z. = 85·96, C. = 54·15. Non-earth Zinc to Rib = 63·72, C. to Rib = 60·94 megohms absolute. Capacity, Plain = 46·73, Rib = 46·28 mfds.

The cable towards Weston was then tested from ship for D.R. 30 volts, both cores being "free" at Weston.

Tests were highly satisfactory, the cable giving:

Ω Ω
Plain Core 1st min. Zinc total = 35·938 = 6569 per N.M.
Rib ,, ,, ,, = 35·938 = 6569 ,,

Length in circuit = 182·79 N.M.

At 9.50 a.m. (24th), ship started paying out cable towards Waterville buoy, a control test being maintained during the whole time—20 cells being used—cores being "free" at Weston. At 11 a.m., the buoy on Waterville end was reached, and at 11.25 a.m. Waterville end was on board.

The following S. G. was then sent from ship *via* Weston (11.27 a.m.)—"Gott to V. P. and M. E. Thursday, 11.20 a.m. Both ends on

* This includes the capacity of 4·3805 N.M. of cable in after tank.

board. Tests all right both ways. About to make final splice. Weather fine."

From 0.13 to 0.40 p.m., tests for C.R., D.R., and I.C. were made on WATERVILLE end.

Length in circuit = 149·5 N.M.

C.R. Resistance of loop (cor.) = $\overset{\omega}{3796}\cdot4$ = { Plain core = $\overset{\omega}{1901}\cdot19$. Rib ,, = $\overset{\omega}{1895}\cdot21$.

D.R. 30 volts.

Plain core, 1st min., zinc total = $\overset{\Omega}{61}\cdot25 = \overset{\Omega}{9157}\cdot$ per N.M.
Rib ,, ,, ,, = $\overset{\Omega}{47}\cdot116 = \overset{\Omega}{7044}\cdot$,,

Capacity 30 volts.

Plain core. Total Capacity = 46·108 mfds.
Rib ,, ,, ,, = 45·904 ,,

(*For full tests see Appendix.*)

Tests being "O.K." said G.B. to Waterville, and gave out end to prepare for Final Splice, and attention was then given to Weston end—tests being made for C.R., D.R., and Capacity.

WESTON END. *Length in circuit* = 181·620 N.M.

C.R. Resistance of loop (corrected) = $\overset{\omega}{4642}\cdot$ = { Plain core = $\overset{\omega}{2320}\cdot3$. Rib ,, = $\overset{\omega}{2321}\cdot7$.

D.R. 30 volts.

Plain core, 1st min., zinc total = $\overset{\Omega}{40}\cdot834 = \overset{\Omega}{7416}\cdot$ per N.M.
Rib ,, ,, ,, ,, = $\overset{\Omega}{36}\cdot034 = \overset{\Omega}{6544}\cdot$,,

Capacity 30 volts.

Plain core. Total Capacity = 55·372 mfds.
Rib ,, ,, ,, = 54·805 ,,

Tests being highly satisfactory at 1.20 p.m., Weston was called and informed that ship was about to make final splice, and instructions were given to call Waterville at 4 p.m. Closed at

1.25 p.m. with Weston, and gave out end to prepare for Final Splice. The joints were completed at 3.30 p.m.—all bare core and joints brass taped—and at 4.50 splice was finished—splice being compounded as before. 5 fms. were cut off tank cable for splice. At 5 p.m. (24.7.02) the Final Splice was slipped—the bottom temperature at this position being 50° F. The ship then proceeded to pick up Mark Buoy and moorings, which operation being completed at 5.51 p.m., she set on full speed for London.

Removal of Fault in Picked Up Cable.

During the passage home, the picked up cable in fore tank—3·115 N.M. (Indicator length)—containing fault was dealt with. Great difficulty was experienced in locating position of fault, as since picking up the cable the fault had sealed, and even the application of 260 cells = 390 volts, failed to break the fault down, the resistance rising at times to 1·9 Ω. First operation:—Turned down cable on deck and cut at 0·2500 N.M. This $\frac{1}{4}$ mile tested "O.K.," and the cable in tank faulty. Cable remaining in tank = 2·865 N.M.

A further length of 150 fms. was then coiled down on deck from tank cable and cut. The fault was found to be in this 150-fm. length. A loop test (Varley's) taken on this piece was very unsatisfactory, the results varying greatly, as the resistance of the fault was very high. The tests placed fault nearly in centre of cable (natural resultant). A cut was then made at 60 fms. from top end of coil; this piece tested "O.K.," fault being in the 90 fms. piece. A further length of 50 fms. was then cut off which tested "O.K.," leaving 40 fms. which contained the fault. This piece was halved, and the fault found to be in the last 10 fms. remaining on deck.

Therefore the position of fault was at—

2·715 N.M.
0·150 − 0·010 = 0·140 N.M.

2·855 N.M. from the bottom end in tank, *i.e.*, 2·855 from "cut in" by "Buccaneer," 23.7.02.

The 10-fm. length was stripped on board, and the fault removed. A length of one yard of core—both plain and rib—on either side of fault was cut out and handed to Mr. Gott at Gravesend. The fault was in plain core.

NATURE OF FAULT.

At the position of fault the G.P. of plain core had a discoloured patch—yellow—about ½ inch long, and extending about half round circumference of core. The core was sticky at this patch, and had small fibres of jute attached to it. No sign of any puncture whatever. The sheathing and serving at this place were perfect, with no sign of any shell fish or teredo. The only surmise is, that this was a Factory fault caused by some foreign substance on the core. The rib core was perfect at this point.

On arrival at Gravesend on the morning of July 26th, Mr. Gott received a letter from the Superintendent at Weston, containing copies of tests taken from Weston and Waterville respectively, after Final Splice had been slipped, which proved the cable to be in perfect electrical condition. The "Buccaneer" arrived at her moorings off Silvertown at 0.15 p.m. same day.

Since the return of the "Buccaneer" to Silvertown, the picked up cable in fore tank has been spliced up and transferred to after tank. All cable on board belonging to the Commercial Cable Company was tested on the 7th inst. with highly satisfactory results, and copies of these tests will be found in the Appendix, together with revised Loading Table and 75° values.

In the Appendix will be found the following tables, etc.:

Revised lengths and Factory values at 75° F. of Weston—Waterville Cable (both cores).

Tests from ship towards Weston and Waterville at position of "cut in."

Tests from ship towards Weston after removal of fault.

Test on cable in after tank before splicing to Weston end.

Tests from ship towards Weston and Waterville before making Final Splice.

Final tests from Weston and Waterville after repairs.

Distribution of cable in tanks on board "Buccaneer," and 75° F. values before repairs.

Distribution of cable in tanks on board "Buccaneer," and 75° F. values after repairs.

Expenditure tables of new and picked up cable.

Notes on mean bottom temperature.

Distribution of cable on board "Buccaneer" after splicing picked up cable.

Factory values at 75° F. of cable on board "Buccaneer" after splicing picked up cable.

Tests on cable on board S.S. "Buccaneer" after splicing up, 7.8.02.

I am, Dear Sir,

Yours faithfully,

HERBERT E. CANN.
Electrician.

FACTORY ELECTRICAL VALUES AT 75° FAHR.

OF

THE WESTON—WATERVILLE (1885) TWIN CORE CABLE

After Repairs by S.S. "Buccaneer," July 24th, 1902.

[Not including 0·221 N.M. Waterville Land-line.]

Length of Section. N.M.	Length. Total N.M.	C.R. at 75° Fahr.			Capacity.			Remarks.
		Total of Section.	Sum of Totals.	Per N.M. of Section.	Total of Section.	Sum of Totals.	Per N.M. of Section.	
WESTON.				PLAIN	CORE.			
3·845		52·03		13·54	1·185		0·3082	"Bittern."
14·304	18·149	190·80	242·83	13·342	4·342	5·527	0·3036	
1·022	19·171	13·61	256·44	13·342	0·309	5·836	0·3036	
0·671	19·842	8·95	265·39	13·342	0·203	6·039	0·3036	"Marmion."
3·598	23·440	47·67	313·06	13·25	1·202	7·241	0·3340	
1·109	24·549	14·80	327·86	13·342	0·336	7·577	0·3036	
1·089	25·638	14·26	342·12	13·10	0·329	7·906	0·3022	"Mirror."
1·782	27·420	23·77	365·89	13·34	0·539	8·445	0·3025	
5·831	33·251	77·80	443·69	13·34	1·765	10·210	0·3027	
1·561	34·812	27·32	471·01	17·51	0·498	10·708	0·3192	"M.B." Rockport Type.
1·249	36·061	16·63	487·64	13·32	0·377	11·085	0·3019	
0·285	36·346	3·86	491·50	13·55	0·087	11·172	0·3054	"Mirror."
0·630	36·976	8·51	500·01	13·51	0·194	11·366	0·3079	
12·988	49·964	173·38	673·39	13·35	3·930	15·296	0·3027	
8·460	58·424	113·84	787·23	13·46	2·570	17·866	0·3038	
18·524	76·948	245·91	1033·14	13·28	5·580	23·446	0·3013	
14·431	91·379	194·04	1227·18	13·45	4·407	27·853	0·3055	
0·136	91·515	1·80	1228·98	13·222	0·041	27·894	0·2994	
2·623	94·138	34·44	1263·42	13·13	0·867	28·761	0·3304	S.S. "Buccaneer," 17.1.02. Bot. temperature 49°·2 F.
23·515	117·653	310·90	1574·32	13·22	7·040	35·801	0·2994	
60·672	178·325	806·16	2380·48	13·29	18·160	53·961	0·2993	Eastern Splice. "Buccaneer," 24.7.02.
0·280	178·605	3·70	2384·18	13·22	0·084	54·045	0·2995	
0·758	179·363	10·02	2394·20	13·22	0·227	54·272	0·2995	" 18.7.02.
0·064	179·427	0·85	2395·05	13·22	0·019	54·291	0·2995	" 19.7.02.
0·443	179·870	5·86	2400·91	13·22	0·133	54·424	0·2995	" 17.7.02.
0·836	180·706	11·05	2411·96	13·22	0·250	54·674	0·2995	" 17.7.02.
0·916	181·622	12·03	2423·99	13·13	0·303	54·977	0·3304	" 26.5.02.
0·103	181·725	1·37	2425·36	13·29	0·031	55·008	0·2993	
31·575	213·300	425·45	2850·81	13·48	9·595	64·603	0·3040	"Buccaneer's" Final Splice, 24.7 02. Bot. tem. 50¼° Fah. Depth, 54 fms.
86·660	299·960	1154·08	4004·89	13·32	26·098	90·701	0·3011	
10·841	310·801	143·07	4147·96	13·197	3·259	93·960	0·3046	
0·351	311·152	4·61	4152·51	13·13	0·116	94·076	0·3304	S.S. "Buccaneer," 16.6.01.
11·692	322·844	156·31	4308·88	13·37	3·571	97·647	0·3055	
0·340	323·184	4·48	4313·36	13·17	0·113	97·760	0·3330	"Marmion."
7·938	331·122	106·13	4419·49	13·37	2·425	100·185	0·3056	
WATERVILLE.								

FACTORY ELECTRICAL VALUES AT 75° FAHR.

OF

THE WESTON—WATERVILLE (1885) TWIN CORE CABLE

After Repairs by S.S. "Buccaneer," July 24th, 1902.

[Not including 0·221 N.M. Waterville Land-line.]

Length of Section. N.M.	Length. Total N.M.	C.R. at 75° Fahr.			Capacity.			Remarks.
		Total of Section.	Sum of Totals.	Per N.M. of Section.	Total of Section.	Sum of Totals.	Per N.M. of Section.	
WESTON.				Rib	Core.			
3·845		51·94		13·51	1·165		0·303	"Bittern."
14·304	18·149	191·00	242·94	13·35	4·248	5·413	0·297	
1·022	19·171	13·64	256·58	13·35	0·303	5·716	0·2966	
0·671	19·842	8·96	265·54	13·35	0·199	5·915	0·2966	"Marmion."
3·598	23·440	47·63	313·17	13·24	1·202	7·117	0·334	
1·109	24·549	14·80	327·98	13·35	0·329	7·446	0·297	
1·089	25·638	14·24	342·22	13·10	0·335	7·781	0·308	"Mirror."
1·782	27·420	23·76	365·98	13·34	0·527	8·308	0·2959	
5·831	33·251	77·84	443·82	13·36	1·725	10·033	0·2959	
1·561	34·812	27·32	471·14	17·5	0·498	10·531	0·3192	"M.B." Rockport Type.
1·249	36·061	16·83	487·97	13·5	0·369	10·900	0·2956	
0·285	36·346	3·85	491·82	13·5	0·086	10·986	0·3018	"Mirror"
0·630	36·976	8·49	500·31	13·5	0·191	11·177	0·3031	
12·988	49·964	173·38	673·69	13·35	3·843	15·020	0·2960	
8·460	58·424	114·71	788·40	13·56	2·527	17·547	0·2987	
18·524	76·948	245·56	1033·96	13·26	5·529	23·076	0·2986	
14·431	91·379	195·19	1229·15	13·52	4·380	27·456	0·3036	
0·136	91·515	1·80	1230·95	13·267	0·040	27·496	0·2956	
2·623	94·138	34·47	1265·42	13·14	0·863	28·359	0·3291	S.S. "Buccaneer." 17.1.02. Bot. temperature 49°·2 F.
23·515	117·673	311·97	1577·39	13·267	6·950	35·309	0·2956	
60·672	178·325	804·57	2381·96	13·26	17·895	53·204	0·295	Eastern Splice.
0·280	178·605	3·72	2385·68	13·27	0·083	53·287	0·2956	"Buccaneer," 24.7.02.
0·758	179·363	10·06	2395·74	13·27	0·224	53·511	0·2956	" 18.7.02.
0·064	179·427	0·85	2396·59	13·27	0·019	53·530	0·2956	" 19.7.02
0·443	179·870	5·88	2402·47	13·27	0·131	53·661	0·2956	" 17.7.02.
0·836	180·706	11·10	2413·57	13·27	0·247	53·908	0·2956	" 17.7.02.
0·916	181·622	12·04	2425·61	13·14	0·301	54·209	0·3291	" 26.5.02.
0·103	181·725	1·37	2426·98	13·26	0·030	54·239	0·295	"Buccaneer's" Final Splice. 24.7.02. Bot. tem. 50½° Fah. Depth, 54 fms.
31·575	213·300	421·04	2848·02	13·13	9·565	63·804	0·303	
86·660	299·960	1153·23	4001·25	13·30	25·724	89·528	0·2969	
10·841	310·801	142·92	4144·17	13·18	3·209	92·737	0·2960	
0·351	311·152	4·61	4148·78	13·14	0·116	92·853	0·3291	S.S. "Buccaneer," 16.6.01.
11·692	322·844	155·92	4304·70	13·338	3·468	96·321	0·2966	
0·340	323·184	4·48	4309·18	13·17	0·113	96·434	0·3330	"Marmion."
7·938	331·122	105·80	4414·98	13·338	2·354	98·788	0·2966	
WATERVILLE.								

Tests *from Ship towards* Waterville (23/7/02).

Position: "Buccaneer's" cut in.

(Cores looped at Waterville.)

7.40—8.5 p.m. Length in Circuit=149·5 n.m. each core.

Conductor Resistance 20 cells=(30 volts).

Zinc.	Carbon.	
3790	3790	Temperature Bridge Coils=74° F. Correct at 60° F. (Platinoid).
3790	3790	
3790	3790	
3790	3790	

C.R. of loop corrected for leads and temperature B.C.=3797 ω.

Plain Core=1901·49 ω=12·72 ω per n.m. Calculated temperature=52° F.

Rib Core=1895·51 ω=12·68 ω per n.m.

C.R. at 75° F. (from Factory values). Plain Core=1995·5 ω. Rib Core=1989·365 ω.

(Cores Free at Waterville.)

Dielectric Resistance (30 volts).

Plain Core.			Rib Core.		
Mins.	Zinc.	Lead=nil S.R.=10000.	Mins.	Zinc.	
1 =	11	S.R.=10000 m.p.=1.	1 =	14	S.R.=10000.
2 =	7		2 =	10	
3 =	7		3 =	8	
4 =	6		4 =	7	
5 =	6		5 =	7	

Constant 20 cells (30 volts) through 10^5=230 S.R.=400=575· through 1 Ω.

D.R. total, Plain Core=52·274 Ω. D.R. total, Rib Core=41·072 Ω.

D.R. per n.m. „ =7815· Ω at sea temperature. D.R. per n.m. „ =6140· Ω at sea temperature.

Test *from Ship towards* Weston (23/7/02).

Position: "Buccaneer's" cut in.

9.20 p.m. Length in Circuit=181·475 n.m.

Conductor Resistance 20 cells=(30 volts).

Z. and C.=4626 ω. Temperature B.C.=75° F. Correct at 60° F. (Platinoid).

C.R. of loop corrected for temperature, etc.=4635·1 ω.

C.R. of Plain Core=2316·85 ω=12·767 ω per n.m.

„ Rib „ =2318·25 ω=12·774 ω „

C.R. at 75° F. { Plain Core=2422·33 ω. / Rib „ =2423·715 ω.

(Fault in Plain Core=3 n.m. approx. from Ship.)

TESTS *from Ship towards* WESTON (*after cutting out fault,* 24/7/02).

(After picking up and cutting off 3·115 N.M., cable=3·150 N.M. each core.)
2.40 A.M. LENGTH IN CIRCUIT=178·33 N.M. each core.
(Cores Free at Weston.)

DIELECTRIC RESISTANCE (20 cells).

PLAIN Core.			RIB Core.		
Mins.	Zinc.	Lead=nil S.R.=10000.	Mins.	Zinc.	
1	= 21	S.R.=10000 m.p.=1.	1	= 19	S.R.=10000.
2	= 17		2	= 17	
3	= 16		3	= 15	
4	= 15		4	= 14	
5	= 15		5	= 14	

CONSTANT 20 cells through 10^5=230 S.R.=400=575· through 1.

D.R. Total. PLAIN Core=27·381 Ω.
D.R. per N.M. „ =4884· Ω at sea temperature.

D.R. Total. RIB Core=30·264 Ω.
D.R. per N.M. „ =5398· Ω at sea temperature.

(Cores Looped at Weston.)

3 A.M.

Zinc.	Carbon.	
		C.R. 20 cells=30 volts.
4555· ω	4555· ω	Temperature B.C.=72° F. Correct at 60° F. (Platinoid).
4555·	4555·	C.R. of LOOP corrected for temperature B.C., etc.=4562·2 ω.

C.R. of PLAIN Core=2280·4 ω=12·788 ω per N.M.
C.R. of RIB „ =2281·8 ω=12·796 ω „

TEST *on Cable in After Tank* (*before splicing to* WESTON *End,* 24/7/02).

Length=4·4308 N.M. Cable=4·4301 N.M. each Core. Length of Loop=8·86 N.M. Core.
3.30 A.M. (Cores Looped.)
C.R. of LOOP. Leads deducted=112·410 ω Z. & C.
Temperature B.C.=72° F. Correct at 60° F. (Platinoid).
C.R. of Loop corrected=112·59 ω. Temperature tank=68° F.

DIELECTRIC RESISTANCE (200 cells)=300 volts. Lead=1 S.R.=10000.

Mins.	Zinc.	E.R.	Carbon
1	= 28	S.R.=10000	6 24
2	= 25		
3	= 24	D.R. Total =226·86 Ω.	
4	= 23		
5	= 22	D.R. per N.M.=2010· Ω at 68° F.	

CONSTANT 200 cells through 10^5=245 S.R.=40=6125· through 1.

TEST *from Ship towards* WATERVILLE *(before making Final Splice, 24/7/02).*

(Cores looped at Waterville.)

0.13 P.M. LENGTH IN CIRCUIT=149·5 N.M.

CONDUCTOR RESISTANCE 18 cells.

Zinc.	Carbon.	
ω	ω	
3791	3791	
3791	3791	Temperature Bridge Coils=71° F. Correct at 60° F. (Platinoid).
3791	3791	

C.R. of loop corrected for temperature, etc.=3796·4 ω.

PLAIN Core=1901·19 ω=12·72 ω per N.M.

RIB „ =1895·21 ω=12·68 ω „

0.20 P.M. (Cores Free at Waterville.)

DIELECTRIC RESISTANCE (30 volts).

PLAIN Core.				RIB Core.		
Mins.	Zinc.	Lead=nil S.R.=10000.		Mins.	Zinc.	
1 =	10	S.R.=10000 m.p.=1.		1 =	13	S.R.=10000
2 =	8			2 =	11	
3 =	7			3 =	10	
4 =	7			4 =	9	
5 =	6			5 =	8	

CONSTANT 20 cells through 10^5=245 S.R.=400=612·5 through 1 Ω.

D.R. Total PLAIN Core =61·25 Ω.

D.R. per N.M. PLAIN Core=9157· at sea temperature.

D.R. Total RIB Core =47·116 Ω

D.R. per N.M. RIB Core=7044· at sea temperature.

KELVIN'S CAPACITY TEST (*Null method=20 cells*).

Using K. & V.'s Slides.

VALUE OF STANDARD CONDENSERS=39·119 mfds.

PLAIN Core, Slide Reading=5410. Total Capacity=46·108 mfds.

RIB „ „ „ =5399. „ „ =45·904 „

NOTE.—The mean I.C. per N.M. (from 75 sheets) from Waterville to position of splice=0·3024 mfds., PLAIN.

The mean I.C. per N.M. (from 75 sheets) from Waterville to position of splice=0·2982 mfds., RIB.

Therefore the length to Waterville from "Buccaneer's" cut in (23/7/02) by measured capacity

=46·108÷0 3024=152·5 N.M. PLAIN Core } *Mean=153·2 N.M.
=45·904÷0·2982=153·9 N.M. RIB Core }

By Waterville's test to buoyed and sealed end, 24/7/02.

Capacity of PLAIN Core=46·73 mfds.=154·53 N.M.

„ RIB „ =46·28 „ =155·20 „

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* Evidently too long, 149·5 being taken as correct length (see C.R. test).

Tests *from Ship towards* Weston (*before making Final Splice, 24/7/02*).

(Cores looped at Weston.)

Length in Circuit=181·62 N.M. (accepted).

Conductor Resistance 18 cells.

Zinc.	Carbon.	
ω	ω	
4636	4636	Temperature Bridge Coils=71° F. Correct at 60° F. (Platinoid).
4636	4636	

C.R. of loop corrected for temperature, etc.=$\overset{\omega}{4642}$.

Plain Core=$\overset{\omega}{2320{\cdot}3}$. Rib Core=$\overset{\omega}{2321{\cdot}7}$.

(Cores Free at Weston.)

1.1—1.24 P.M.

Dielectric Resistance (30 volts).

Plain Core.			Rib Core.		
Mins.	Zinc.	Lead=nil S.R.=10000.	Mins.	Zinc.	
1	= 15	S.R.=10000.	1	= 17	S.R.=10000.
2	= 13		2	= 16	
3	= 11		3	= 15	
4	= 10		4	= 14	
5	= 10—1		5	= 13 to 12	

Constant 20 cells through 10^5=245 S.R.=400=612·5 through $\overset{\Omega}{1}$.

D.R. total, Plain Core=$\overset{\Omega}{40{\cdot}834}$. D.R. total, Rib Core=$\overset{\Omega}{36{\cdot}030}$.

D.R. per N.M., ,, =$\overset{\Omega}{7416}$ at sea temperature. D.R. per N.M., ,, =$\overset{\Omega}{6544}$ at sea temperature.

Kelvin's Capacity Test (*Null method=20 cells*).

Using K. & V.'s Slides.

Value of Standard Condensers=39·119 mfds.

Plain Core, Slide Reading=5860. Total Capacity=55·372 mfds.

Rib ,, ,, =5835. ,, ,, =54·805 ,,

Note.—The mean I.C. per N.M. (from 75 sheets) from Weston to Ship's position =0·3025 mfds., Plain.

The mean I.C. per N.M. (from 75 sheets) from Weston to Ships's position =0·2983 mfds., Rib.

Therefore the calculated length from ship to Weston by measured Capacity

=55·372÷0·3025=183·07 N.M. by Plain Core.

=54·805÷0·2983=183·73 N.M. by Rib Core.

Note.—The length has been taken as 181·62 N.M.

TESTS *taken from* WESTON *and* WATERVILLE (*after Repairs*, 25/7/02).

WESTON'S TESTS.

PLAIN Core, mean of 10 minutes Abs. Z.=23·36 megs.
" " " " " C.=22·10 "
RIB " " " " Z.=23·63 "
" " " " " C.=18·50 "
C.R. RIB and PLAIN=8445 ohms.

WATERVILLE'S TESTS.

PLAIN Core, Insulation 10th minute Z.=8080 Ω per N.M.
" " " " C.=9390 Ω "
NOTE.—RIB not given.
C.R. PLAIN=4227·5 ω. RIB=4219·5 ω.

NOTE.—The above results were received—by letter—by Mr. Gott on the "Buccaneer's" arrival at Gravesend, 26.7.02, from Mr. Gorton, the Commercial Cable Co.'s Superintendent at Weston-super-Mare.

DISTRIBUTION OF CABLE IN TANKS ON LEAVING THE THAMES, 21.7.02.

55 02e

AFTER TANK.

Piece.		Factory No.		Core		Length. N.M.
Pt, "C"	...	8553	...	Twin	=	0·2840
„ "C"	...	8553	...	„	=	0·7500
"A"	...	8553	...	„	=	0·0634
"B"	...	8553	...	„	=	0·4371
"D"	...	8553	...	„	=	0·8270
Original	...	8553	...	„	=	2·0190
—	...	8514	...	Single	=	0·9150
—	...	8514	...	„	=	2·9920

FORE TANK.

EMPTY.

Weston—Waterville (1885) Cable Repairs.

July, 1902.

FACTORY ELECTRICAL VALUES AT 75° FAHR. OF CABLE ON BOARD S.S. "BUCCANEER,"

On Leaving the Thames, July 21st, 1902.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total.	Per N.M.	Total.	Per N.M.	Total.	Per N.M.	
8553 Pt. Piece "C"	Plain	0·2840	0·2877	3·8034	13·22	0·0862	0·2995	—	—	
	Rib			3·8178	13·27	0·0850	0·2956	—	—	"Buccaneer," 18.7.02.
8553 Pt. Piece "C"	Plain	0·7500	0·7583	10·0247	13·22	0·2271	0·2995	—	—	
	Rib			10·0626	13·27	0·2242	0·2956	—	—	"Buccaneer," 19.7.02.
8553 Pc. "A"	Plain	0·0634	0·0640	0·8462	13·22	0·0192	0·2995	—	—	
	Rib			0·8493	13·27	0·0189	0·2956	—	—	"Buccaneer," 17.7.02.
8553 Pc. "B"	Plain	0·4371	0·4429	5·8560	13·22	0·1327	0·2995	—	—	
	Rib			5·8770	13·27	0·1310	0·2956	—	—	"Buccaneer," 17.7.02.
8553 Pc. "D"	Plain	0·8270	0·8362	11·0550	13·22	0·2505	0·2995	—	—	
	Rib			11·0970	13·27	0·2472	0·2956	—	—	"Buccaneer," 26.5.02.
8553 Original	No. 1	2·0190	2·0410	26·798	13·13	0·6743	0·3304	1171·	2390·	
	No. 2			26·820	13·14	0·6717	0·3291	1438·	2935·	
Twin Core as splic'd up	Plain	4·3805	4·4301	58·3833	13·18	1·3900	0·3137	—	—	
	Rib			58·5237	13·21	1·3780	0·3111	—	—	
8514 Single Core		0·915		15·738	17·2	0·3257	0·356	417·5	382·	
Core 70/75		2·992		49·667	16·6	1·0711	0·358	100·9	302·	
		3·907		65·405	16·74	1·3968	0·3575	81·26	317·5	

DISTRIBUTION OF CABLE IN TANKS ON RETURN TO THE WORKS AFTER REPAIRS, 26.7.02.

AFTER TANK.

Type.	Factory No.	Core.	Length. N.M.
Original	8553	Twin	1·1085
,,	8514	Single	0·9150
,,	8514	,,	2·9920

FORE TANK.

Piece.	Factory No.	Core.	Length. N.M.
4	8552	Twin	0·050
3	8552	Twin	0·060
2	8552	Twin	0·250
1	8552	Twin	2·715

NOTE.—The Factory values at 75° F. will be found in a revised loading table compiled after splicing operations on board S.S. "Buccaneer," July 30th, 31st, and August 1st, 1902, when the 4 pieces of Type 8552 Twin Core Cable were spliced up and transferred to After Tank.

There is a coil (co ning 2 15-fm. lengths married together) on top of Cable in Fore Tank, which is useless for splicing.

Weston—Waterville (1885) Cable Repairs.

July, 1902.

EXPENDITURE OF CABLE, TYPE 8553, TWIN CORE.

Ex. After Tank.

Length of Section coiled on board on leaving the Thames { Cable=4·3805 / Core =4·4301 } =4·3805 N.M.

	Laid in Section.	Expended.
Pt. Piece	"C"=0·2770 N.M. + 0·007 (Splice)	=0·2840 N.M.
„ „	"C"=0·7500 „	=0·7500 „
„	"A"=0·0634 „	=0·0634 „
„	"B"=0·4371 „	=0·4371 „
„	"D"=0·8270 „	=0·8270 „
Original	8553=0·9055 N.M. + 0·005 (Splice)	=0·9105 „
	3·2600 (3·2970 Core)	3·2720 Cable. (3·3090 Core) =3·2720

Remaining in tank (After), Twin Core, 8553=1·1085
=(1·1211 Core)

SUMMARY.

Total Cable expended =3·2720 N.M.
„ „ laid in Section=3·2600 N.M.

Cut off for Splices=0·0120 N.M.

Weston—Waterville (1885) Cable Repairs.

July, 1902.

EXPENDITURE OF CABLE, TYPE 8552, TWIN CORE.

Picked Up, July 23rd and 24th, 1902.

N.M

Total Cable Picked Up and Coiled in Fore Tank = 3·115

Note.—The above Cable was cut into the following lengths, on July 25th and 26th, in order to cut out the high resistance fault which existed in same:

	N.M.	
Piece 1 =	2·715	
„ 2	0·250	
„ 3 =	0·060	
„ 4 =	0·050	
	3·075	To be spliced up.
Coil containing 2 lengths of 15 fms. each. No use for splicing.	0·030	
10 fms. containing fault stripped	0·010	
Total =	3·115	

Weston—Waterville (1885) Cable Repairs.

July, 1902.

Notes *re* mean bottom temperatures calculated from tests taken from Ship and Shore.

C.R. Test from Ship to Waterville.

July 23rd, 1902. Length in Circuit=149·5 n.m.

Total C.R. at 75° F. (of Plain and Rib cores)=$\overset{\omega}{3984·86}$
„ „ *measured*, of loop, corrected =3797·
Calculated temperature by Silvertown Coefficients=52° F.
„ „ C., F. and T.'s „ =53°·3 F.

C.R. Test from Ship to Weston.

July 24th, 1902. Length in Circuit=181·475 n.m.

Total C.R. at 75° F. (of Plain and Rib Cores)=$\overset{\omega}{4846·04}$
„ „ *measured*, of loop, corrected =4635·1
Calculated temperature by Silvertown Coefficients=53°·75 F.
„ „ C., F. and T.'s „ =55° F.

Weston's Test after completion of Repairs.

July 25th, 1902. Length in Circuit=331·122 n.m.

Total C.R. at 75° F. (of Plain and Rib Cores)=$\overset{\omega}{8834·47}$
„ „ *measured*, of loop, corrected =8445·
Calculated temperature by Silvertown Coefficients=53°·5 F.
„ „ C., F. and T.'s „ =54°·7 F.

Waterville's Test after completion of Repairs.

July 25th, 1902. Length in Circuit=331·122 n.m.

Total C.R. at 75° F. (of Plain and Rib Cores)=$\overset{\omega}{8834·47}$
„ „ *measured*, of Loop, corrected =8447·
Calculated temperature by Silvertown Coefficients=53°·5 F.
„ „ C., F. and T.'s „ =54°·8 F.

Temperature (bottom) at position of Final Splice, 24.7.02=50° F. Depth, 54 fms.

DISTRIBUTION OF CABLE IN TANKS AFTER SPLICING UP AND TRANSFERRING PICKED UP CABLE, TYPE No. 8552.

SILVERTOWN, 30 AND 31.7.02. REVISED TO DATE, 1.8.02.

AFTER TANK.

Factory No.		Core.		Piece.		Length. N.M.	
8552	...	Twin	...	4	=	0·050	}
8552	...	„	...	1	=	2·708	}
8552	...	„	...	2	=	0·243	}
8552	...	„	...	3	=	0·053	}
8553	...	„	...	—	=	1·1085	}
8514	...	Single	...	—	=	0·915	}
8514	...	„	...	—	=	2·992	}

FORE TANK.

EMPTY.

Weston—Waterville (1885) Cable Repairs.

July, 1902.

FACTORY ELECTRICAL VALUES AT 75° FAHR. OF CABLE ON BOARD S.S. "BUCCANEER,"

After Splicing Up and Transferring Picked Up Cable, Type 8552.

Revised to Date, August 1st, 1902.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total.	Per N.M.	Total.	Per N.M.	Total.	Per N.M.	
8552	Plain			0·6645	13·29	0·0151	·2993	—	—	Top Sec. in Tank.
Piece 4		0·050	0·0506							
	Rib			0·6710	13·26	0·0149	·2950	—	—	
	Plain			36·389	13·29	0·8196	·2993	—	—	"Buccaneer," 31.7.02.
Piece 1		2·708	2·738							
	Rib			36·305	13·26	0·8078	·2950	—	—	
	Plain			3·265	13·29	0·0735	·2993	—	—	"Buccaneer," 30.7.02.
Piece 2		0·243	0·2457							
	Rib			3·258	13·26	0·0725	·2950	—	—	
	Plain			0·718	13·29	0·0162	·2993	—	—	"Buccaneer," 30.7.02.
Piece 3		0·053	0·054							
	Rib			0·716	13·26	0·0159	·2950	—	—	
				The above pieces as spliced up.						
8552	Plain			41·037	13·29	0·9244	·2993	—	—	
Twin Core		3·054	3·089							
	Rib			40·950	13·26	0·9111	·2950	—	—	
8553	No. 1			14·720	13·13	0·3704	·3304	2132·	2390·	
Twin Core		1·1085	1·1210							
	No. 2			14·730	13·14	0·3689	·3291	2618·	2935·	
		0·915		15·738	17·2	0·3257	0·356	417·5	382·	
8514										
Single Core 70/75		2·992		49·667	16·6	1·0711	0·358	100·9	302·	
		3·907		65·405	16·74	1·3968	0·3575	81·26	317·5	

Tests *on Cable in After Tank* (7/8/02).

Factory Values at 75° F.

Total C.R.=65·405=16·74 per N.M.
„ I.C. =1·3968=0·3575 „
„ D.R.=81·26 =317·5 „

Section 8554, Single Core. Length=3·907 N.M.

Z. and C.
C.R. 18 cells. Cable=61·450 Temperature B.C.=64° F., correct at 60° F. (Platinoid).
Lead = 0·656
63·794 Total C.R. corrected=63·828=16·337 per N.M.

Temperature of water on cable=62° F. Calculated temperature=63¼° F.

D.R. 200 cells=300 volts. Leakage on leads=1 S.R.=10000.

Mins.	Zinc.	E.R.	Carbon.
	S.R.=10000.		
1 =	23	5½	26
2 =	21	3	25
3 =	20		24
4 =	20		23
5 =	19		22
6 =	19		
7 =	18½		
8 =	18		
9 =	17½		
10 =	17½		

Total D.R.=327·4.
D.R. per N.M.=1279· at tank temperature.
„ „ =459 reduced to 75° by Siemens' coefficient.

All readings absolutely steady.

Cable covered with water.

Constant 200 cells through 10^5=275 S.R.=40=6875·3 through 1.

Factory Values at 75° F.

	No. 1 Core.	No. 2 Core.
C.R. Total	14·720=13·13 per N.M.	14·730=13·14 per. N.M.
I.C. „	=0·3704=·3304 „	0·3689=·3291 „
D.R. „	=2132· =2390· „	2618· =2935· „

Section 8553, Twin Core. Length { 1·1085 N.M. Cable. 1·1210 N.M. Core.

C.R. 18 cells. No. 1 Core. No. 2 Core. Temperature B.C.=64° F., correct at 60° F. (Platinoid).

	No. 1 Core.	No. 2 Core.
Cable=	14·920	15·000
Leads=	0·656	0·656
	14·264	14·344

Temperature of water on cable=62° F.
Calculated temperature by Plain Core No. 1=60½° F.
„ „ „ „ „ 2=62½° F.

C.R. corrected, No. 1=14·272 total. =12·731 per N.M.
No. 2=14·352 total. =12·803 per N.M.

Tests *on Cable in After Tank* (7/8/02)—*Contd.*

D.R. 200 cells=300 volts. Leakage on leads=1 S.R.=10000.

No. 1 Core. Mins.	Zinc.	E.R. S.R.=10000.	Carbon.		No. 2 Core. Mins.	Zinc.	E.R. S.R.=10000.	Carbon.
1 =	2½	1	2½		1 =	2 bare	½	2
2 =	2½		2½	Ω	2 =	1½		1½
3 =	2		2	Q=6875·3 through 1.	3 =	1½		1½
4 =	2		2		4 =	1		1
5 =	1½		2 to 1½		5 =	1		1

No. 1 Core. All Readings absolutely steady. No 2. Core.

D.R. total=4583·6 Ω — Cable covered with water. — D.R. total=6875·3 Ω

D.R. per N.M.=5138· Ω at 62° F. — D.R. per N.M.=7707· Ω at 62° F.

„ „ =1844· reduced to 75° by Siemens' coefficient. — „ „ =2766· reduced to 75° by Seimens' coefficient.

Tests made by Mr. Herbert E. Cann.

Factory Values at 75° F.

	Plain Core.		Rib Core.	
Total C.R. =	41·037	= 13·29 per N.M.	40·950 ω	= 13·26 per N.M.
„ I.C. =	0·9244	= ·2993 „	0·9111	= ·2950 „

Section 8552 (spliced section), Twin Core. Length { Indicated Length. Cable, 3·054 N.M. Core, 3·089 N.M.

C.R. 18 Cells.

Plain Core.		Rib Core.	
Cable =	39·250 ω	Cable =	39·640
Leads =	0·656.	Leads =	0·656.
	38·594.		38·984.

Temperature B.C. = 64 F.° Correct at 60° F. (Platinoid).

C.R. corrected. Plain = 38·615 ω total. Rib = 39·005 ω total.

12·503 ω per N.M. 12·625 ω per N.M.

Temperature of water on Cable = 62° F.
Calculated temperature by Plain Core = 46° F.*
„ „ „ Rib „ = 51½° F.*

* Note.—If we assume that the 75s of the section from which this length was cut (63·925 N.M., Type 8552) are correct, then the length as given by ship's Ind., when picking up, is slightly too long.

Accepting the Cable in tank as having taken up the temperature of water—viz., 62° F., and reducing the C.R. per N.M. at 75° F. respectively, of Plain and Rib Cores to this temperature, the length becomes:

By Plain Core 38·615 ÷ 12·924 = 2·988 N.M. Core length = 2·953 N.M. Cable.
„ Rib „ 39·005 ÷ 12·918 = 3·019 „ „ „ = 2·985 „ „

Tests *on Cable in After Tank* (7/8/02)—*Contd.*

D.R. 200 Cells = 300 volts. Leakage on leads = 1 S.R. = 10000.

Plain Core. Mins.	Zinc. S.R.=10000.	E.R.	Carbon.
1 =	5	2½	6
2 =	4	1	5
3 =	4		4½
4 =	3		
5 =	3		
6 =	2½		Ω
7 =	2½	Q = 6875·3 through 1.	
8 =	2½	All readings absolutely steady.	
9 =	2½	Cable covered with water.	
10 =	2		

Rib Core. Mins.	Zinc. S.R.=10000.	E.R.	Carbon.
1 =	10	2	12
2 =	8½	1	11
3 =	8½		10
4 =	8		
5 =	8		
6 =	8		
7 =	8		
8 =	7½		
9 =	7½		
10 =	7½		

Plain Core.

D.R. total = 1718·8 Ω.

„ per N.M. = 5309· Ω at 62° F.

„ „ = 1906· Ω reduced to 75° F. by Siemens' Coefficient.

Rib Core.

D.R. total = 982·2 Ω.

„ per N.M. = 3034· Ω at 62° F.

„ „ = 1090· Ω reduced to 75° F.

Tests made by Mr. Herbert E. Cann.

Capacity Test to Determine Length of Spliced Section, 8552, Twin Core.

Plain Core.—I.C. per N.M. from 75 Sheets = 0·2993 mfds.

Rib „ „ „ „ „ = 0·2950 „

Kelvin's "Null" Method (20 Cells)—using K. & V.'s Slides.

Plain Core.

Standard Condenser = 0·9624 mfds.
Slide Reading = 4880·
Capacity of Lead = 0·0011 mfds.

Total Capacity = 0·9168 mfds.

Then ·9168 ÷ ·2993 = 3·063 N.M. of Core
= 3·027 N.M. of Cable.

Rib Core.

Standard Condenser = 0·9624 mfds.
Slide Reading = 4870·
Capacity of Lead = 0·0011 mfds.

Total Capacity = 0·9125 mfds.

Then ·9125 ÷ ·2950 = 3·093 N.M. of Core
= 3·057 N.M. of Cable.

Mean.

	Core.	Cable.
Plain	3·063	3·027
Rib	3·093	3·057
2 |	6·156	6·084
	*3·078	*3·042

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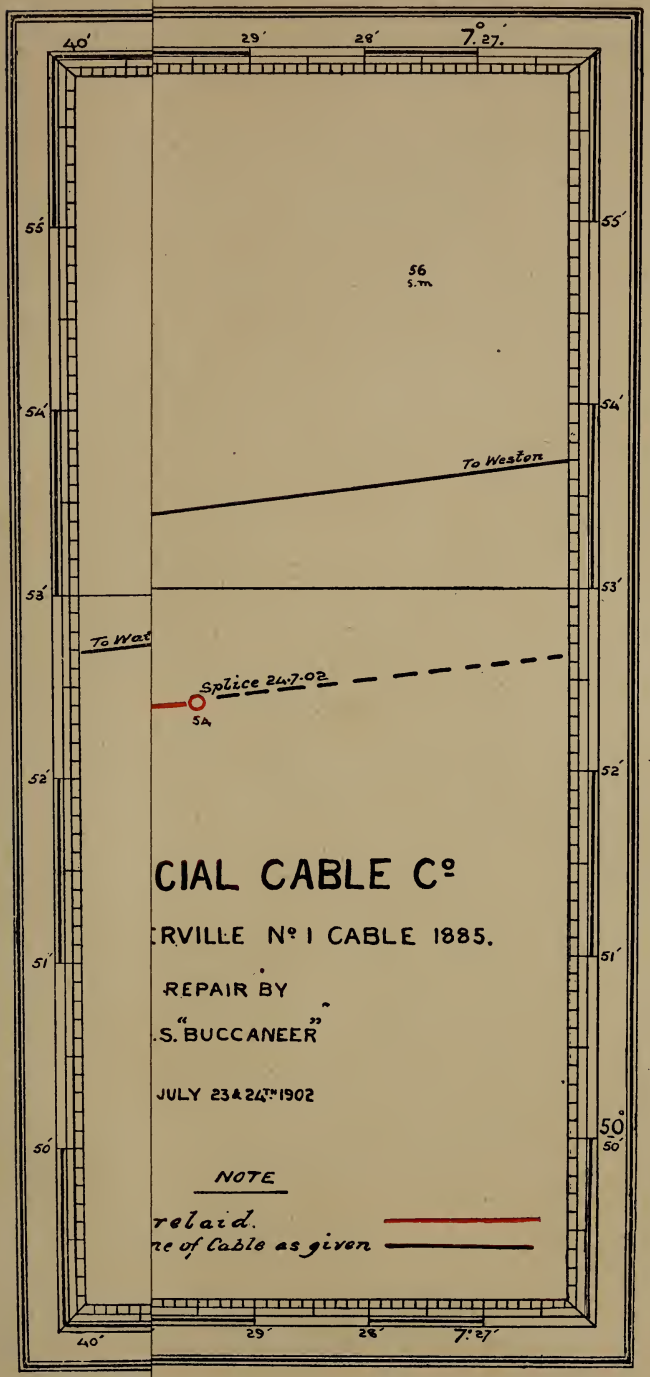
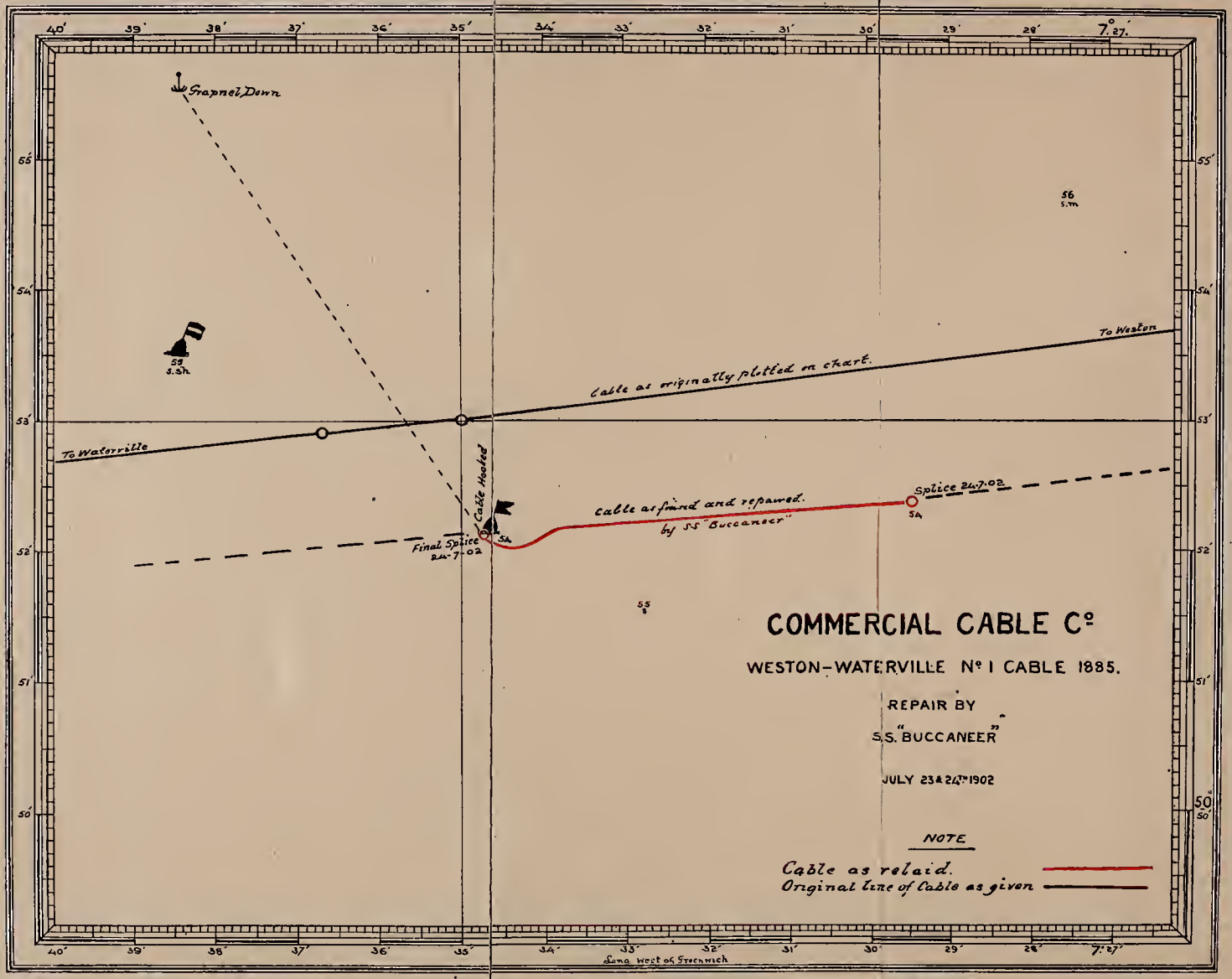
*These lengths are within 11 to 12 fms. of the length as given by ship's indicator.


40'
29'
28'
7° 27'
55'
54'
53'
52'
51'
50°
50'
56
S.M.
To Weston
To Wat
Splice 24.7.02
SA
CIAL CABLE Cº
RVILLE Nº 1 CABLE 1885.
REPAIR BY
S. "BUCCANEER"
JULY 23 & 24TH 1902
NOTE
relaid.
ne of Cable as given
40'
29'
28'
7° 27'


Grapnel Down
To Weston
Cable as originally plotted on chart.
To Waterville
Cable Hooked
Cable as found and repaired by SS "Buccaneer"
Splice 24-7-02
Final Splice 24-7-02
COMMERCIAL CABLE Co
WESTON-WATERVILLE No 1 CABLE 1885.
REPAIR BY
"
S.S. BUCCANEER
"
JULY 23 & 24TH 1902
NOTE
Cable as relaid.
Original line of Cable as given
Long West of Greenwich

COMMERCIAL CABLE COMPANY'S CHARTER.

HAVRE–WATERVILLE REPAIR,

SEPTEMBER, 1902.

S.S. "BUCCANEER."

GENERAL REPORT.

GENERAL INDEX.

Havre—Waterville Cable Repair Expedition, September, 1902.

S.S. "BUCCANEER."

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GENERAL REPORT.

Silvertown,
London, E.,
September 30th, 1902.

M. H. Gray, Esq.,
Silvertown.

Dear Sir,

A fault having developed in the Havre—Waterville 1885 Cable, the C.S. "Buccaneer" was chartered by the Commercial Cable Company to repair it, and left her moorings below Silvertown at 2.20 p.m. on September 5th, and proceeded to the position of fault localized at about 45 miles E × S ½ S from Bishop's Rock Lighthouse.

Messrs. Gott and Hensman accompanied the expedition as representatives of the Commercial Cable Company. Mr. Hensman is the navigating officer of the C.S. "Mackay Bennett."

The weather was fine and sea smooth, and the "Buccaneer," after taking two soundings on the evening of the 6th, to verify the bottom temperature along the route of cable, arrived at the D.R. position of fault at 10 a.m. on Sunday, September 7th, and after putting down a mark-buoy, made a short drag in the vicinity, but returned to buoy at noon, to verify its position, and found it 2½ miles to the Nd. The second drag proved successful; the cable was brought up to the bows at 2 p.m., the fault being found in the Havre end. The Waterville end was buoyed and cable picked up towards Havre. After 3·8 N.M. had been picked up, cable was cut, and Havre end testing O.K. (fault being inboard), the end was spliced on to the 6 N.M. length taken aboard at Silvertown previous to leaving (Siemen's type, No. 8512), and ship commenced to pay out at

5.15 a.m. on Monday, September 8th, steering N 69 W true, and arrived at buoy on Waterville end at 6.22 a.m.; this end was brought aboard and final splice made (after despatching telegram to advise "Silvergray" of our operations) and slipped successfully at 11.50 a.m.

A strong wind from ENE sprang up whilst lying with ends at the bows, and this increased to moderate gale and rough sea, so that picking up the mark-buoy was a somewhat difficult task, but was accomplished at 1.30 p.m.; ship then proceeded to London, stopping at Prawle Point to ask if any orders were awaiting us.

The evening of the 8th, 3·4 miles of the picked-up cable was transferred from the fore to after tank, and the fault was found in a flattened portion caused by a fisherman's trawl: on stripping this, part of the conductor was found exposed. The two pieces, after cutting out fault, were spliced together, and these pieces spliced to the balance of the 6·0 miles in after tank, making 5·732 N.M. altogether of Single Core, No. 8512; and 76 fathoms of scrap cable was stripped, and the core sent to Mr. Gott at his request.

Wind and sea moderated as the ship came up Channel, and after signalling off Prawle Point for orders, at 11 a.m., September 9th, she proceeded to London, stopping off Dungeness to take aboard Pilot Howgego, and again, at Gravesend, for Pilot Twist, who made her fast to the buoy below Silvertown at 2 p.m., September 10th. The actual time spent on the repair being practically 5 days.

I enclose herewith (1) Mr. H. E. Cann's electrical report, (2) Blue print of chart showing the repair, and (3) Engineer's general log.

I am,

Your obedient Servant,

F. W. ROBINSON.

LIST OF STAFF, OFFICERS, CABLE HANDS & CREW.

Mr. F. W. Robinson,	Engineer in Charge.
,, H. E. Cann,	Electrician.
,, R. G. Wood,	Accountant.
,, B. C. Combe,	Commander.
,, J. S. Roberts,	Chief Officer.
,, A. Clunie,	2nd ,,
,, H. A. Rowe,	3rd ,,
W. Mackenzie,	Carpenter.
J. Kelly,	Boatswain.
J. McDermott,	Boatswain's Mate.
4 Quartermasters.	
6 Able Seamen.	
1 Deck Boy.	
Mr. A. White,	Chief Engineer.
,, W. McFarlane,	2nd ,,
,, J. W. Cadman	3rd ,,
,, M. Anthony,	4th ,,
J. Maguire,	Donkeyman.
6 Firemen.	
4 Trimmers.	
Mr. A. Patrick,	Chief Steward.
C. Martin,	2nd Steward and Storekeeper.
A. Thiselton,	Chief Cook and Baker.
J. Griffen,	2nd Cook and Butcher.
J. Nolan,	Pantryman.
Engineer's Steward.	
2 Assistant Stewards.	
1 Scullion.	

CABLE HANDS.

W. Tillyer,	Foreman.
R Keys,	Leading Hand.
W. Mack,	Cable Hand.
R. Knights,	,, ,,
J. Blaza,	,, ,,
R. Barber,	,, ,,
S. Ransome,	,, ,,
J. Smith,	,, ,,
H. Hills,	Fitter.
A. E. Newton,	Fitter's Mate.
R. Welsh,	Jointer.

Representatives of the Commercial Cable Company.

Mr. J. Gott.

Mr. W. Hensman.

SUMMARY.

Staff	3
Cable Hands	11
Officers and Crew	42
Visitors	2
Total on board leaving London	58

MECHANICAL DESCRIPTION OF CABLE.

---

6 N.M. Main Cable, sent from Messrs. Siemens & Co., No. 8512. 3.9.02.

Conductor :—Strand of 7 copper wires each ″·023 dia., weighing 70 lbs. per N.M.

Dielectric :—Gutta percha one coat to ″·205 dia., weighing 75 lbs. per N.M.

Serving :—Tanned jute yarn.

Sheathing :—10 B.B.G.I. wires ″·143 dia.

Outer Serving :—Two coats prepared jute yarn alternating with three coats of compound.

Ex. diameter = ″0·915.

Weight in air, dry = 2·138 tons per N.M.
,, ,, wet = 2·175 ,, ,,
,, in sea water = 1·433 ,, ,,

DISTRIBUTION OF CABLE ON LEAVING SILVERTOWN, MAY 9TH, 1902.

AFTER TANK.

Type.	Number.	N.M.	Tons.
Main ...	8512 single core ...	6·000 =	13·05
H.I. ...	8514 „ „ ...	0·915 =	5·06
„ ...	8514 „ „ ...	2·992 =	16·54
	TOTAL =	9·907 =	34·65

FORE TANK.

Type.	Number.	Piece.	N.M.	Tons.
L.I. ...	8553 twin core ...	...	1·109 =	3·79
Int. ...	8552 „ „ ...	3 ...	0·053 =	0·15
„ ...	„ „ „ ...	2 ...	0·243 =	0·70
„ ...	„ „ „ ...	1 ...	2·708 =	7·84
„ ...	„ „ „ ...	4 ...	0·050 =	0·14
	TOTAL =		4·163 =	12·62

SUMMARY.

	N.M.	TONS.
Fore Tank, Twin Core	4·163 =	12·62
After Tank, Single Core	9·907 =	34·65
TOTAL =	14·070 =	47·27

DISTRIBUTION OF CABLE ON RETURN TO SILVERTOWN, SEPTEMBER 9TH, 1902.

AFTER TANK.

Type.	Siemens' Factory No.	Core.	Length. N.M.		Weight. Tons.
Main	8512	Single	0·304	=	0·66
„	„	„	3·398	=	7·39
„	„	„	2·030	=	4·42
H.I.	8514	„	0·915	=	5·06
„	„	„	2·992	=	16·45
TOTAL			9·639	=	34·07

FORE TANK.

Type.	Siemens' Factory No.	Core.	Piece.	Length. N.M.		Weight. Tons.
L.I.	8553	Twin	–	1·109	=	3·79
Int.	8552	„	3	0·053	=	0·15
„	„	„	2	0·243	=	0·70
„	„	„	1	2·708	=	7·84
„	„	„	4	0·05	=	0·14
TOTAL				4·163	=	12·62

SUMMARY.

	N.M.		TONS.
Fore Tank	= 9·639	=	34·07
After Tank	= 4·163	=	12·62
TOTAL	= 13 802	=	46·69

DISTRIBUTION OF WEIGHT IN SHIP ON LEAVING GRAVESEND.

	TONS.
Cable in fore tank	12·6
Water ,, ,, ...	Nil.
Cable in after tank	34·7
Water ,, ,, ...	Nil.
Coal in bunkers	150·0
Fresh water in after fresh water tank	13·0
,, ,, ,, fore cone	7·0
,, ,, ,, side tanks	5·0
Water in ballast tanks (amidships)	70.0
,, ,, ,, (aft.)	15·0
Boatswain's stores Carpenter's ,, ...	1·0
Cable stores and buoys	15·0
Engine-room stores	0·5
Water in main boilers...	28·0
Steward's stores	5·0
Extra chain cable	1·0
Spare anchors, ropes, etc.	2·0
,, propeller	3·0
Deck machinery	10·0
TOTAL = 372·8 tons	

Draught { Fore 11′ 6″
Aft. 13′ 6″. Mean 12′ 6″

COMMERCIAL CABLE COMPANY'S CHARTER.

HAVRE—WATERVILLE REPAIR,

SEPTEMBER, 1902.

S.S. "BUCCANEER."

DRUM CO-EFFICIENTS. Circ. of Drum = 17′ 2½″

Type.	Circ. in inches.	Revs. per N.M.	Log.	Fms. per Rev.
Main 8512 Single Core ...	2·875	348·867	2·5426596	2·908
H.I. 8514 „ „ (new)...	4·375	346·385	2·5395594	2·929
„ „ „ „ (old)...	4·250	346·590	2·5398169	2·927
L.I. 8553 (twin core) ...	3·465	347·886	2·5414375	2·916
Int. 8552 „ ...	3·387	348·016	2·5415988	2·915
Grappling Rope—				
4 × 6 (used)	4·646	345·940	2·5390016	2·932
Buoy Rope—				
4 × 4 (new)	3·860	347·233	2·5406213	2·922
3 × 3 (new)	2·700	349·159	2·5430228	2·905

HAVRE—WATERVILLE CABLE REPAIR EXPEDITION.

SEPTEMBER, 1902.

STEAMING FROM LONDON TO POSITION OF FAULT.

S.S. "BUCCANEER."

STEAMING FROM LONDON TO POSITION OF FAULT.

S.S. "BUCCANEER."

HOUR.	
	FRIDAY, SEPTEMBER 5th, 1902 (1st DAY OUT).
A.M. 9.0	Hands joined ship off Silvertown.
P.M. 1.0	Mr. J. Gott (Commercial Cable Company's Representative), Mr. Hensman (Navigating Officer C.S. "Mackay Bennett"), and Messrs. F. W. Robinson, H. E. Cann and R. G. Wood joined ship.
2.20	Let go moorings and proceeded down river, Pilot Twist in charge.
4.30	Off Gravesend, Pilot Twist left and Pilot Lygo took charge.
9.35	Pilot Lygo left at Dover, taking letters and telegrams.
11.20	Dungeness abeam.
	SATURDAY, SEPTEMBER 6th, 1902 (2nd DAY OUT).
A.M. 2.30	Beachy Head abeam.
4.0	Light breeze, fine and clear. Bar. 30·07. Ther. 72°.
7.30	St. Catherine's abeam, dist. 3 N.M.
8.0	Gentle wind and fine clear weather. Bar. 30·10. Ther. 70°.
NOON.	Light breeze, fine and clear. Bar. 30·10. Ther. 72°. Position { Lat. 50° 19′ N. Lon. 2° 14′ W. Distance run from Dungeness 137·5 N.M.
P.M. 4.0	Bar. 30·05. Temp., Dry Bulb 76°, Wet Bulb 74°.

HOUR.	SATURDAY, SEPT. 6th, 1902 (2nd DAY OUT)—*Contd.*
P.M. 7.15	Stopped and sounded in 41 fms. Bottom temperature 58·2° F. Sea surface 59° F. Position sounding No. 1 { Lat. 49° 45′·0 N. / Lon. 3° 55′·5 W.
7.28	Set on.
8.0	Light airs and overcast with rain. Bar 30·08. Ther. 62°.
	PUTTING DOWN MARK BUOY AND GRAPPLING FOR CABLE.
11.0	Stopped and sounded in 48 fms. Bottom temperature 56·5° F. Sea surface 59·5° F. Position sounding No. 2 { Lat. 49° 30′·3 N. / Lon. 4° 45′·0 W.
11.20	Set on. N. 70 W.
MID.	Light breeze and overcast with rain. Bar. 30·10. Ther. 74°.
	SUNDAY, SEPTEMBER 7th, 1902 (3rd DAY OUT).
A.M. 4.0	Light breeze, fine and clear. Bar. 30·10. Ther. 77° F.
8.0	Light breeze, fine and clear. Bar. 30·13. Ther. 76° F.
9.40	Sounded in 66 fms., fine sand. Position sounding No. 3 { Lat. 49° 42′·1 N. / Lon. 7° 28′·8 W.
10.5	Let go mark buoy "42 P." Position same as sounding. *Moorings.*—$\frac{5}{8}$″ bridle, 15 fms. side rope, 20 fms. $\frac{3}{4}$″ chain, 65 fms. 4 × 4 rope, 20 fms. $\frac{5}{8}$″ chain, mushroom 4 cwts. 1 qr. 16 lbs., lamphanger and lamps.
10.30	Ship in position to lower grapnel.
10.37	Grapnel (ordinary) down, 100 fms. 4 × 4 and 10 fms $\frac{3}{4}$″ chain. Commenced.

HOUR. A.M.

SUNDAY, SEPT. 7th, 1902 (3rd DAY OUT)—*Contd.*

DRAG No. 1.

Position { Lat. 49° 43′·1 N. / Lon. 7° 28′·8 W.

11.25 Commenced to pick up grapnel so as to get back to mark buoy to verify its position by noon latitude.
Position—mark buoy "P" bearing N 25 E dist. 2 N.M.

11.30 Grapnel up. Set on for mark buoy "P." Distance run 2·0 N.M.
Position { Lat. 49° 41′·5 N. / Lon. 7° 29′·3 W.

NOON. Moderate breeze, fine and clear.
Bar. 30·15. Ther. 70°.

BUOYING WATERVILLE END AND PICKING UP TOWARDS HAVRE.

P.M.

0.15 Sounded in 64 fms. Bottom temperature 50° F.
Position sounding No. 4 { Lat. 49° 42′·1 N. / Lon. 7° 28′·8 W.

0.30 Ship in position to lower grapnel for Drag No. 2.

0.38 Two grapnels (ordinary and centipede as trailer) down; 100 fms. 4 × 4 rope, 10 fms. $\frac{3}{4}$″ chain with 2 fms. $\frac{3}{4}$″ chain between grapnels and $2\frac{1}{2}$ fms. trail chain. Commenced.

DRAG No. 2.

Position { Lat. 49° 42′·9 N. / Lon, 7° 29′·7 W.
Mark buoy "P" bearing S 35° E dist. 1·0 N.M.

1.50 Strain rose to $2\frac{1}{2}$ tons. Commenced to pick up. During drag strain nil, and working engines as required.

2.0 30 fms. rope and chain out. Strain, 2 tons.

2.8 Cable D.S. type No. 8512 at bows on second prong of centipede grapnel, put on bending-on chains.

2.25 Cut cable on grapnel.

2.50 Havre end handed over to testing room. Cut 2 fms. off Havre end for damaged sheathing.

HOUR. P.M.	SUNDAY, SEPT. 7th, 1902 (3rd DAY OUT)—*Contd.*
3.10	Testing room finished with Havre end, which is faulty. Bent drum rope on again, veered away this end and picked up on Waterville end.
3.45	Waterville end on board.
3.55	Waterville end handed to testing room. Spoke Waterville, tests "O.K." Cablehands and crew getting buoy and moorings ready for buoying Waterville end.
4.35	Electrician finished with end.
4.50	End sealed, and moorings of buoy "H" bent on.
5.0	Commenced to pay out cable buoy moorings, and commenced to pick up on Havre end.
5.20	Slipped cable buoy "H" on Waterville end. Position { Lat. 49° 40′·3 N. Lon. 7° 31′·9 W. Mark buoy "P" bearing N 47½° E dist. 2·7 N.M. *Moorings.*—⅝″ Bridle, 15 fms. side rope, 20 fms.; ¾″ chain, 50 fms. 4×4 rope, 20 fms. ⅝″ chain; 10 fms. ⅝″ stray chain; Mushroom 4 cwt. 1 qr. 7 lb. Sent cable boat away to put lamps on cable buoy "H."
5.30	Havre end on board and taken to Testing Room.
5.40	Cable boat returned.
6.15	Reported from Electrician that fault is 5 N.M. from ship.
6.18	Commenced picking up towards fault, coiling cable in fore tank.
7.0	1 N.M. of D.S. No. 8512 picked up, cable coiling well, strain from 0–25 cwt.
7.30	1·5 N.M. of D.S. No. 8512 picked up, strain from 0–25 cwt.
7.50	2 ,, ,, ,, ,, ,, ,,
8.0	Bar. 30·20. Ther. 71° F.
8.15	2·5 N.M. of D.S. No. 8512 picked up, strain from 0–25 cwt.
8.45	3 ,, ,, ,, ,, ,, ,,
9.10	3·5 ,, ,, ,, ,, ,, ,,
9.30	Ind.=1326 revs.=3·8 N.M. of D.S. No. 8512 picked up. Cut cable, tested and found fault inboard.

HOUR. P.M.

SUNDAY, SEPT. 7th, 1902 (3rd DAY OUT)—*Contd.*

LAYING CABLE BACK TO WATERVILLE BUOYED END.

9.40 Spoke Havre and tested, results satisfactory.
Note.—A loop test taken on picked-up piece in fore tank placed the fault ·380 N.M. from bottom end.

10.15 End handed over for splice between Havre end and D.S. No. 8512 in after tank.

11.0 Commenced joint.

MID. Light breeze, fine and clear. Bar. 30·15. Ther. 74° F.

MONDAY, SEPTEMBER 8th, 1902 (4th DAY OUT).

A.M.

0.30 Finished joint. 7 fms. cut off for splice from seaward end (Havre). Commenced splice.

2.0 Finished splice. Men went below till daylight.

4.0 Moderate breeze and clear weather.
Bar. 30·12. Ther. 70° F.

4.45 All hands called.

5.15 Commenced to pay out, making N 69° W, true course.
Splice D.S.—D.S. on drum, Ind. set at zero.
Ship's engines 24 revs.
Position of splice { Lat. 49° 38′·9 N. / Lon. 7° 26′·4 W.
Mark buoy "P" N 25° W, dist. 3·6 N.M.

5.35 Increased ship's engines to 26 revs.

5.45 Ind. = 349 revs. = 1·0 N.M. D.S. type paid out from after tank. Ship's engines 26 revs.

5.55 Ind. = 680 revs. = 1·95 N.M. cable laid.
Splice between D.S. No. 8512 tape and D.S. No. 8512 yarn.
Position { Lat. 49° 39′·6 N. / Lon. 7° 29′·2 W.

5.57 Ind. = 698 revs. = 2·0 N.M. D.S. type laid from after tank.
Ship's engines 26 revs.

HOUR.	MONDAY, SEPT. 8th, 1902 (4th DAY OUT)—*Contd.*
A.M.	
6.10	Ind. = 1047 revs. = 3 N.M. D.S. type laid from after tank. Ship's engines 26 revs.
6.22	Up to cable buoy "H" ind. = 1361 revs. = 3·9 N.M. of D.S. laid from after tank, ship's engines being worked as required. Lowered cable boat.
6.30	Shackled on drum rope. Knocked up tumbler, put stoppers on cable, picked up cable buoy "H," took turns of D.S, type off drum. Ind. = 1360 revs. = 3·9 N.M. Paid out ·070 N.M. main cable 8512 through stoppers. Original length 6·000 N.M. Remaining in after tank 2·030 ,, Total paid out 3·970 ,,
6.50	Commenced to heave up moorings.
7.15	Mushroom at bows, unshackled and secured on deck.
7.25	Waterville end on drum, put on stoppers.
7.55	End handed over to electrician.
8.0	Fresh wind and sea, fine. Bar. 30·07. Ther. 71° F. Cut cable from after tank. Total D.S. paid out from splice, 3·970 N.M. Distance overground, 3·8 N.M. Slack 4·5%. Opened ends out for testing. Tests "O.K."
9.30	Commenced joint between Havre—Waterville ends.
10.45	Joint finished and commenced final splice.
11.45	Final splice completed. Set about slipping bight. Sounded in 63 fms. Bottom temp. 50°. Sea surface 63° F. Position sounding No. 5 { Lat. 49° 43′·3 N. / Lon. 7° 31′·9 W.
11.53	Slipped final splice. Set on to pick up mark buoy "P," N 47½° E. Distance 2·7 N.M.

STEAMING BACK TO LONDON.

NOON.	Moderate gale and rising sea. Bar. 30·08. Ther. 70° F.
P.M.	
1.0	Picked up mark buoy "P."

HOUR.	MONDAY, SEPT. 8th, 1902 (4th DAY OUT)—*Contd.*
P.M.	
1.25	Mushroom up. All clear. Set on for Gravesend. Cable-hands clearing up and stowing away gear.
4.0	Moderate gale and high sea. Ship taking heavy seas forward. Bar. 30·00. Ther. 75° F.
6.30	Commenced to turn over picked up cable from fore tank to after tank, to get at faulty place. Amount of cable transferred from fore to after tank = 3·41 N.M., then cut; 10 fms. being cut out at flattened place, therefore leaving 0·38 N.M. in fore tank.
8.0	Strong wind and high sea, ship pitching heavily and taking water aboard forward. Bar. 29·83. Ther. 76° F.
MID.	Wind and sea moderating, dull cloudy weather. Bar. 29·75. Ther. 76° F.
	TUESDAY, SEPTEMBER 9th, 1902 (5th DAY OUT).
A.M.	
2.50	Lizard's light abeam.
4.0	Moderate gale and high sea. Bar. 29·73. Ther. 70° F.
8.0	Strong wind and overcast with high head sea. Bar. 29·70. Ther. 75° F.
11.0	Slowed ship off Prawle Point, hoisted number and enquired if any orders. Reply received: "No."
NOON.	Moderate breeze and hazy weather. Bar. 29·70. Ther. 75° F. Start Point N 61° W, dist. 7·75 N.M. Cable-hands spliced up remaining 0·380 N.M. of No. 8512 in fore tank and transferred it to after tank. Length of piece in after tank { 2·030 N.M. 3·398 ,, 0·304 ,, Total 5·732 N.M.
P.M.	
4.0	Similar weather. Bar. 29·70. Ther. 73° F.

HOUR.	TUESDAY, SEPT. 9th, 1902 (5th DAY OUT)—*Contd.*
P.M.	
8.0	Similar weather, overcast with rain. Bar. 29·75. Ther. 75° F.
9.0	St. Catherine's abeam, dist, 4·3 N.M.
MID.	Light breeze, fine and clear. Bar. 29·87. Ther. 76° F.
	WEDNESDAY, SEPTEMBER 10th, 1902 (6th DAY OUT).
A.M.	
2.5	Beachy Head abeam, dist. 5 N.M.
4.0	Light breeze, fine and clear. Bar. 29·90. Ther. 80° F.
5.0	Stopped off Dungeness and picked up Pilot (Mr. Howgego).
6.45	Signalled off Dover.
8.0	Light breeze, fine but hazy weather. Bar. 29·90. Ther. 76° F.
11.25	Signalled off Southend.
NOON.	Light breeze, fine and clear. Bar. 29·82. Ther. 71° F.
P.M.	
0.55	Stopped off Gravesend. Sea Pilot left and river Pilot (Twist) boarded.
2.30	Moored to buoys off Silvertown and finished with engines. Cable-hands during first part of the day stowing gear and clearing up.

NOTE.—Ship's Company was paid off at Tidal Basin Shipping Office at noon, September 11th, 1902.

COMMERCIAL CABLE COMPANY.

HAVRE—WATERVILLE REPAIR, SEPTEMBER, 1902.

S.S. "BUCCANEER."

ELECTRICAL REPORT.

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ELECTRICAL REPORT.

September, 1902.

F. W. Robinson, Esq.,
Engineer in Charge,
S.S. "Buccaneer."

Dear Sir,

A fault having developed in the above cable on the 31st ult., which rendered "duplex" working impracticable, though the section was working well by "simplex," the "Buccaneer" was chartered the following day by the Commercial Cable Company to effect the repair. On the 3rd inst. a length of 6·000 N.M. of Cable Type 8512 Core 70/75 was barged across from Messrs. Siemens Bros.' Works and transhipped to the "Buccaneer's" after tank. Electrical particulars of the same will be found in the loading table in Appendix.

At 2.20 p.m., 5th inst.—Mr. J. Gott, Electrician in Chief to the Commercial Cable Company, Mr. Hensman, Navigating Officer s.s· "Mackay Bennett," and Staff having joined ship off Silvertown—the "Buccaneer" cast off moorings and proceeded down river.

During the run down Channel, Mr. Gott handed me a number of S.G.'s relating to tests taken from Havre and Waterville respectively to localise position of fault. Although taken by different methods—Blavier, Overlap and Kennelly—the results from both ends agreed very closely and from these I placed fault at a little over 315 miles (cable) from Bléville, Havre and 195 miles from Waterville.

The Channel passage was uneventful, fine weather being experienced throughout, and at 7.15 p.m., September 6th, stopped ship to take temperature sounding.

Depth, 41 fathoms.
Bottom temp. 58½° F.
Surface temp. 59° F.
Position { Lat. 49° 45′·0 N.
Lon. 3° 55′·5 W.

At 11.5 p.m. same evening, sounded again in 48 fathoms.
Bottom temp. 56½° F.
Surface temp. 59½° F.
Position { Lat. 49° 30′·3 N.
Lon. 4° 45′·0 W.

At 10.5 a.m. the next morning (7th inst.), the ship having arrived on cable ground, a mark buoy "P" was lowered in 66 fathoms, and at 10.37 a.m. paid out grapnel for Drag 1, raising same again at 11.30 and ran back to mark buoy to verify position by noon sights. A sounding was taken again at mark buoy.

Depth, 64 fathoms.
Bottom temp. 50° F.
Position { Lat. 49° 42′·1 N.
Lon. 7° 28′·8 W.

Opportunity was now taken to test the top piece of cable in after tank (L=6·000 N.M. received from Siemens Bros., 3/9/02), 180 volts being used for D.R. Following are results:

D.R. total 1st min.—Zinc and Carbon = $\overset{\Omega}{479{\cdot}2} = \overset{\Omega}{2875}$ per N.M. at sea temp.

The grapnel was lowered again at 0.30 p.m. for Drag 2, and at 1.50 p.m. cable was hooked, the Havre end being brought on board and in Testing Room at 2.50 p.m. Havre was called and ship received immediate reply. Signals failing slightly. The end being free at Havre a D.R. test taken from ship gave only $\overset{\omega}{2277}$ total. Having ascertained the electrical conditions of cable on Havre side, the end was handed over to Engineer to veer away in order to pick up on Waterville side, which cable was handed to Testing Room at 3.50 p.m., when ship called shore and received immediate answer.

Tests were taken with the following results:

D.R. total, 1st min., Zinc (30 volts) = 19·9 Ω = 3888 Ω per N.M. at sea temperature.

C.R. total (mean Z. and C.), corrected = 3222·94 ω.

Length in circuit = 195·158 N.M.

(*For full tests see Appendix.*)

NOTE.—Position agreed upon for "Buccaneer's" cut in (by C.R., etc.):

From Waterville = 195·158 N.M.
,, Havre = 315·316 N.M.

Length of Section = 510·474 N.M.

The tests on Waterville end being satisfactory, the following S.G. was despatched 4.17 p.m.:

"Gott to G.M., V.P., and M.E. Cut in Havre 2 p.m., Sunday. Now buoy Waterville end, and pick up to fault on Havre side. Weather fine."

N.B.—Before sealing and buoying, the cable was put to "Earth" on board, for Waterville to take C.R.

Waterville C.R. to ship (corrected) = 3222 ω.

At 5.20 p.m. (7th) buoyed Waterville end (end sealed), and shortly after started picking up on Havre cable towards fault, coiling down in fore tank. At 5.48 spoke Havre, who "free'd" end for ship to test, but on calling again after the interval, five minutes, ship was unable to get shore—continuity having failed. Tests were taken to locate position of fault, which placed same between 50 ω to 55 ω from ship, very many tests giving practically the same results. A control test (1 Leclanché cell) was applied to cable during the whole time ship was engaged in picking up, and although strict watch was

kept, no indication whatever—either by change of resistance or unsteadiness—was observed to lead one to suppose that fault had passed inboard. When 3·8 N.M. had been picked up it was decided to cut and test. On this being done the fault was found to be in cable recovered and coiled down in tank, and the cable outboard—towards Havre—O.K.

A loop test placed fault at 0·380 N.M. from bottom end in tank, and the fault was subsequently found at this position at a crushed place which had evidently been caused by a steam trawler.

From 9.40 to 10.5 p.m. tests were taken from ship on Havre end with the following results:

Mean total C.R. (Z. and C.) corrected $= 5214^{\omega}$.

D.R. (30 volts) 1st min., Zinc, total $= 8{\cdot}928^{\Omega} = 2800^{\Omega}$ per N.M. at sea temperature.

Tests taken O.K. to Havre, the end was given out for splicing on to cable in after tank, the joint and splice being finished at 2 a.m. the following morning—8th inst.)—joint and all bare core being brass taped and splice compounded over all. The night being extremely dark, it was decided to await daylight before paying out cable to Waterville buoyed end.

A D.R. test taken on Havre side after splicing up to cable in after tank gave:

Total D.R. (30 volts) 1st min., Zinc $= 8{\cdot}928^{\Omega} = 2834^{\Omega}$ per N.M. at sea temperature.

At 5.20 a.m. (8th inst.) ship started paying out cable to buoy on Waterville end, a control test (30 volts) being maintained throughout, and at 6.20 the buoyed end was reached, 3·97 N.M. of Type 8512 being laid between buoys, the end being on board at 7.25 a.m., when Waterville was called and instructed to "free" end for seven minutes, and a D.R. test was taken from ship.

D.R. test towards Waterville before making final splice:

Length in circuit = 195·158 N.M.

D.R. total, 1st min., Z. (30 volts) = $\overset{\Omega}{20{\cdot}565} = \overset{\Omega}{4013}$ per N.M. at sea temperature.

(*For full test see Appendix.*)

Tests having shown cable to be electrically O.K., the following S.G.'s were sent, *viâ* Waterville, 8.20 a.m.:

"Gott to G.M., V.P., and M.E. Monday, 8 a.m. Have taken out fault in Havre cable, now about to make final splice—blowing."

8.27 a.m. "Robinson to 'Silvergray, London.' Now making final splice, 10 a.m. Monday. Expect to arrive London Wednesday forenoon. All well."

Waterville was now instructed to call Havre at 10.30 a.m., and at 8.30 the end was given out to prepare for final splice. Attention was then given to Havre end and a short insulation test taken from ship gave the following:

D.R. (30 volts) total 1st min. Zinc = $\overset{\Omega}{8{\cdot}173} = \overset{\Omega}{2546}$ per N.M. at sea temp

(*For full test see Appendix.*)

Everything being satisfactory, ship advised Havre: "We now make final splice—blowing. Call Waterville at 10.30 this morning. G.B." And at 8.45 a.m. the end was given out to prepare for final splice.

NOTE.—Owing to a strong breeze blowing and sea increasing rapidly, it was deemed advisable to economise time as much as possible, consequently only a short insulation test was taken on each side to ascertain if the D.R. was satisfactory before making the final splice.

During the process of making the final splice a temperature sounding was taken.

Depth 63 fms. Bottom temperature 50° F.

Position { Lat. 49° 40′·3 N.
Lon. 7° 31′·9 W.

At 11.45 a.m. (8th inst.) the splice was finished—the joint and all bare core being brass taped and the splice compounded; and at 11.53 a.m. the final splice was slipped and ship set on to pick up mark buoy, which, owing to the bad weather prevailing, was not accomplished until 1.20 p.m., when the "Buccaneer" proceeded to London.

During the evening of the same day 3·410 N.M.—length determined by Capacity (*see Appendix*)—of the cable picked up during repairs to this section and coiled in fore tank, were transferred to after tank. The cable was then cut at a flattened place and a length of 10 fms. was also cut off, leaving 0·380 N.M. p.u. cable type 8512 in fore tank.

Character of Fault.—Cable flattened for some little distance, evidently the work of a trawler. Of the core stripped on board 20 feet was very badly strained and indented, and in one place the conductor was slightly exposed.

The above length (3·410 N.M.) was then tested for D.R. with 180 volts and gave a Dielectric Resistance of 2614 Ω per N.M. (1st min. zinc) at tank temp. 63° F.

The next day (9th inst.) a splice was made between the top end of cable remaining in after tank, type 8512 (shipped o/b "Buccaneer." from Siemens Bros. 3/9/02) (L=6·000 – 3·970=2·030 N.M.) and the bottom end of picked up cable L=3·140 N.M. transferred on the 8th inst. from the fore tank, 6 fms. being cut off p.u. cable for splice. *See Expenditure List.*

The piece of p.u. cable type 8512 remaining in fore tank having tested O.K. was turned over and spliced up to cable in after tank, a length of 76 fms. being cut off the bottom end, it being too screwy to pay out again. 6 fms. were cut off the 3 mile piece for the splice. *See Expenditure List.*

On arrival at Gravesend about noon on the 10th inst, Mr. Gott received telegraphic advice from the Superintendent at Waterville *re*

tests on Havre—Waterville Cable after repairs, tests being taken at Waterville. The following are the figures received:

$$\text{Insulation} \begin{cases} \text{Zinc} & = 3795 \\ \text{Carbon} & = 3486 \end{cases} \Omega \text{ per N.M. aft. ? mins.}$$

The "Buccaneer" arrived off Silvertown at 2 p.m. same day, where Messrs. J. Gott and Hensman disembarked.

In the Appendix will be found the following tables, etc.:

Revised Lengths and Factory Values at 75° F. of the Havre—Waterville Section.

Types and Lengths of Cable Sections after repair of the Havre—Waterville Section.

Tests from Ship towards Havre and Waterville on recovering cable.

Tests from Ship towards Havre and Waterville before making final splice.

Distribution of Cable in tanks o/b "Buccaneer" and 75° F. values *before* repairs.

Distribution of Cable in tanks o/b "Buccaneer" and 75° F. values *after* repairs.

Expenditure Table of *new* and picked-up cable.

I am, dear Sir,

Yours faithfully,

HERBERT E. CANN,

Electrician.

HAVRE—WATERVILLE (1885) CABLE.

FACTORY ELECTRICAL VALUES AT 75° FAHR.

AFTER REPAIR BY S.S. "BUCCANEER," SEPTEMBER 8TH, 1902.

	Length. N.M.	C.R. at 75° F. Total. ω	Induction Capacity. Total. mfds.	Remarks.
BLEVILLE.	20·632	359·2	6·376	
	2·892	26·89	1·012	
	9·228	160·7	2·861	
	0·407	3·73	0·133	
	3·411	59·38	1·054	
	12·813	223·00	3·970	
	0·845	7·76	0·276	
	1·290	21·44	0·460	
	9·222	160·5	2·847	
	2·406	22·09	0·787	
	7·449	129·67	2·302	"Mirror's" Splice.
	5·000	86·94	1·546	S.S. "Buccaneer," 5.2.02.
	2·154	37·05	0·767	
	41·267	717·58	12·757	
	3·251	30·12	1·095	
	13·994	245·3	4·215	
	1·593	16·47	0·471	
	4·189	38·88	1·483	
	3·321	57·28	1·026	
	20·239	354·9	6·095	
	0·445	7·67	0·138	
	8·545	147·4	2·649	
	0·260	2·38	0·121	
	36·875	636·00	11·455	
	0·770	8·68	0·231	
	6·307	108·8	1·959	
	2·787	46·32	0·995	
	33·835	586·8	10·515	
	48·889	855·36	15·783	
	7·190	125·47	2·196	S.S. "Buccaneer," 8.9.02.
	3·970	67·57	1·318	
	32·623	569·30	9·964	
	48·788	844·60	15·16	
	1·258	21·77	0·391	
	2·409	41·77	0·748	
	2·822	32·72	0·926	
	1·673	15·29	0·560	
	13·080	226·45	4·065	
	67·201	1177·17	20·347	
	25·294	439·52	7·678	
WATERVILLE.	510·624	8719·92	158·732	
	Underground	at Waterville.		
	0·221	3·536	0·0701	

HAVRE—WATERVILLE (1885) CABLE.

TYPES AND LENGTHS OF CABLE SECTIONS

AFTER REPAIR BY S.S. "BUCCANEER," SEPTEMBER 8TH, 1902.

	Type.	Length of Section. N.M.	Total Length. N.M.	Remarks.
BLEVILLE C.H.	8512	0·110	0·110	
	Beach	0·050	0·160	
	8517	1·000	1·160	
	8516	6·000	7·160	
	5	9·000	16·160	
	4	4·472	20·632	
	E.T.C. B	2·892	23·524	"Amber."
	8514	9·228	32·752	
	E.T.C. B	0·407	33·159	"Mirror," April, '98.
	8514	3·411	36·570	
	8514	12·813	49·383	
	E.T.C. B	0·845	50·228	"Mirror."
	8514	1·290	51·518	
	8514	9·222	60·740	
	E.T.C. B	2·406	63·146	"Mirror," May, '98.
	8514	7·449	70·595	
	8514	5·000	75·595	
	8514	2·154	77·749	"Buccaneer," 5.2.02.
	8514	41·267	119·016	
	E.T.C. B	3·251	122·267	"Amber."
	8513 A	13·994	136·261	
	E.T.C. B	1·593	137·854	
	E.T.C. B	4·189	142·043	"Chiltern."
	8513 A	3·321	145·364	
	8513 A	20·239	165·603	
	8513 A	0·445	166·048	
	8513 A	8·545	174·593	"Electra."
	E.T.C. B	0·260	174·853	
	8513 A	36·875	211 728	
	8147	0·770	212·498	"Bittern."
	8513 A	6·307	218·805	
	8514	2·787	221·592	
	8513 A	0·724	222·316	"Marmion."
	8513	82·000	304·316	
	8512	7·190	311·506	
	8512	3·970	315·476	"Buccaneer," 8.9.02.
	8512	32·623	348·099	
	8512	48·788	396·887	
	8512	1·258	398·145	
	8512	2·409	400·554	
	E.T.C. B	2·822	403·376	"Mirror."
	E.T.C. D	1·673	405·049	
	8512	81·525	486·574	
	8513	2·000	488·574	
	8514	4·000	492·574	
	8515	9·000	501·574	
	8516	8·000	509·574	
	8517	1·000	510·574	
WATERVILLE OFFICE.	Beach	0·050	510·624	
	Underground	0·221	510·845	

Tests *from Ship towards* Waterville (7/9/02).

Position : "Buccaneer's" cut in.

(Cable Free at Waterville.)

3.55 to 4.15 p.m. Length in Circuit=195·158 n.m.

Dielectric Resistance (30 volts).

Mins.	Zinc.	Lead=nil S.R. 10000.
1 =	32	S.R. 10000 m.p.=1.
2 =	28	
3 =	25	1st min. D.R. Total =19·9 Ω.
4 =	24	
5 =	23	1st min. D.R. per n.m.=3888 Ω at sea temperature.

Constant 20 cells (30 volts) through 10^5=255 S.R. 400=637·5 Ω through 1.

(Cable Earthed at Waterville.)

Conductor Resistance 18 cells=(27 volts).

Zinc. ω	Carbon. ω	Leads=0·66.
3240	3193	Ratio=1000 : 1000.
3237	3198	
3232	3199	Temperature Bridge Coils=76° F.
3233	3205	Correct at 60° F. (Platinoid).
3226	3205	
3234	3202	

Mean C.R. total corrected for temperature B.C., leads, etc.=3222·94 ω.

Note.—The cable being earthed on board, a C.R. test taken from Waterville made the resistence=3222 ω (corrected).

Tests *from Ship towards* Havre (*after cutting out fault*, 7/9/02).

(Cable Free at Havre.)

9.43 to 10.5 p.m. Length in Circuit=311·516 n.m.

Dielectric Resistance (30 volts).

Aft Mins.	Zinc.	Lead=nil S.R. 10000.
1 =	70	S.R. 10000 m.p.=1.
2 =	65	
3 =	60	1st min. D.R. Total =8·928 Ω.
4 =	58	
5 =	55	1st min. D.R. per n.m.=2800 Ω at sea temperature.

Constant 20 cells through 10^5=250 S.R. 400=625·0 Ω through 1.

(Cable Earthed at Havre.)

CONDUCTOR RESISTANCE 18 cells=(27 volts).

Zinc.	Carbon.
ω	ω
5473	4960
5482	4915
5489	4960
5495	4935

Leads=0·66.

Ratio=1000 : 1000.

Temperature Bridge Coils=76° F.
Correct at 60° F. (Platinoid).

Mean C.R. total corrected and leads deducted=5214 ω.

CAPACITY TEST *from Ship on* HAVRE *side (after splicing up to Cable in After Tank,* 8/9/02).

(End Free at Harve.)

1 a.m. LENGTH=317·509 N.M.

KELVIN'S "NULL" METHOD (20 cells) using K. & V.'s Slides.

Standard Condensers=39·205 mfds. (K.).
Slide Reading S.R. =7204.

TOTAL CAPACITY OF CABLE IN CIRCUIT=101·01 mfds.

NOTE.—This includes the Capacity of 6·000 N.M. of Type 8512 spliced up in after tank, which equals 1·992 mfds. Therefore 101·01—1·992=99·018 mfds., which, on comparing this Capacity with the 75° Values, represents a length of 316·236 N.M. in circuit between Ship and Havre, as against 317·509 N.M. (length agreed upon by C.R. Values and taken as correct), a difference of only 1·273 N.M.

TEST *from Ship on* HAVRE *End of Cable (after splicing to Cable in After Tank*—6·000 N.M. *Type No.* 8512—*and before paying-out to* WATERVILLE *Buoy,* 8/9/02).

(End Free at Harve.)

LENGTH IN CIRCUIT=311·516 N.M.+6·000 N.M.—0·007 N.M. (spliced)=317·509 N.M.

DIELECTRIC RESISTANCE (30 volts).

Aft. Mins.	Zinc.
1 =	70
2 =	66
3 =	63
4 =	62
5 =	59

Lead=nil S.R. 10000.

S.R. 10000 m.p.=1.

1st min. D.R. Total =8·928 Ω.

1st min. D.R. per N.M.=2834 Ω at sea temperature.

CONSTANT 30 volts through 10^5=250 S.R. 400=625 through 1.

TEST *from Ship towards* WATERVILLE (*before making Final Splice*).

(End Free at Waterville.)

DIELECTRIC RESISTANCE (30 volts). LENGTH IN CIRCUIT=195·158 N.M.

Mins. Zinc. Lead=nil S.R. 10000.
1 = 31 S.R. 10000 m.p.=1.
2 = 28 Ω
3 = 25 1st min. D.R. Total =20·565
4 = 25 Ω
5 = 23 1st min. D.R. per N.M.=4013 at sea temperature.
Ω
CONSTANT 20 cells through 10^5=255 S.R. 400=637·5 through 1.

TEST *from Ship towards* HAVRE (*before making Final Splice*).

(End Free at Havre.)

DIELECTRIC RESISTANCE (30 volts). LENGTH IN CIRCUIT=311·506 N.M.

Mins. Zinc. Lead=nil S.R. 10000.
1 = 78 S.R. 10000 m.p.=1.
2 = 74 Ω
3 = 72 1st min. D.R. Total =8·173.
4 = 71 Ω
5 = 69 1st min. D.R. per N.M.=2546 at sea temperature.
Ω
CONSTANT 20 cells through 10^5=255 S.R. 400=637·5 through 1.

TEST *on picked up Cable Type* 8512, *transferred from Fore to After Tank* (8/9/02).

LENGTH=3·41 N.M. (by capacity).

CAPACITY BY KELVIN'S NULL METHOD (30 volts) using K. & V.'s Slides.

Standard Condenser=0·9624 mfds.
Slide Reading =5176.

$$X=0{\cdot}9624\ \frac{10000-5176}{5176}=1{\cdot}0326 \text{ mfds. TOTAL CAPACITY.}$$

NOTE.—The I.C. per N.M. of this section by 75 values=0·3031 mfds., therefore 1·0326 ÷ 0·3031=3·41 N.M. length of piece transferred.

DIELECTRIC RESISTANCE 120 cells=(180 volts).

Mins. Zinc. Lead=nil S.R. 10000.
1 = 5 to 6 S.R.=10000. Readings approximate only, ship plunging heavily.
2 = 4 to 5 Ω Ω
3 = 4 D.R. Total (1st min. Z.)=766·7=2614 per N.M. at tank temperature 63° F.

CONSTANT 120 cells through 10^5=230 S.R. 60.

COMMERCIAL CABLE COMPANY'S CHARTER.

HAVRE—WATERVILLE 1885 REPAIRS.

FACTORY ELECTRICAL VALUES AT 75° FAHR. OF CABLE ON BOARD S.S. "BUCCANEER,"

ON LEAVING THE THAMES, SEPTEMBER 5TH, 1902.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total per N.M.		Total per N.M.		Total per N.M.		
				ω		mfds.		Ω		
Single Core 70/75					AFTER	TANK.				
8512		6·000		102·12	17·02	1·992	0·332	96·67	580	Received from Siemens Bros., 3.9.02.
8514		0·915		15·738	17·2	0·3257	0·356	417·5	382	
"		2·992		49·667	16·6	1·0711	0·358	100·9	302	
		3 907		65·405	16·74	1·3968	0·3575	81·26	317	
					FORE	TANK.				
Twin Core 8553	No. 1	1·1085	1·1210	14·720	13·13	0·3704	0·3304	2132	2390	
	No. 2			14·730	13·14	0·3689	0·3291	2618	2935	
	Plain 1	0·053	0·054	0·718	13·29	0·0162	0·2993	—	—	
8552 Piece 3	Rib 2			0·716	13 26	0·0159	0·2950	—	—	
	Plain 1	0·243	0·2457	3·265	13·29	0·0735	0·2993	—	—	"Buccaneer," 30.7.02.
Piece 2	Rib 2			3·258	13·26	0·0725	0·2950	—	—	
	Plain 1	2·708	2·738	36·389	13·29	0·3196	0·2993	—	—	"Buccaneer," 30.7.02.
Piece 1	Rib 2			36·305	13·26	0·8078	0·2950	—	—	
	Plain 1	0·050	0·0503	0·6645	13·29	0·0151	0·2993	—	—	"Buccaneer," 31.7.02.
Piece 4	Rib 2			0·6710	13·26	0·0149	0·2950	—	—	
Above 4 pieces spliced up	Plain	3·054	3·089	41·037	13·29	0·9244	0·2993	—	—	
	Rib			40·950	13·26	0·9111	0·2950	—	—	

EXPENDITURE TABLE.

New Cable. Siemens' 8512.

	N.M.
Received from Messrs. Siemens Bros. off Telegraph Works, Silvertown, 3.9.02	= 6·000
Laid in Havre—Waterville Section, 8.9.02	= 3·970 N.M.
Remaining on board in "Buccaneer's" After Tank after completion of repairs	= 2·030 „
Total ...	= 6·000—

Cable Recovered during Repairs.

	N.M.
Total Cable picked up, Type 8512	= 3·800
Transferred to After Tank and spliced up 3·410 — 0·012 (2 splices)	= 3·398 N.M.
Transferred to After Tank and spliced up	= 0·304 „
Cut off, flattened place, position of fault	= 0·010 „
*Cut off first end picked up—screwy...	= 0·076 „
Cut off Splice, etc.	= 0·012 „
Total ...	= 3·800—

Cable cut out of Havre—Waterville Section during Repairs.

	N.M.
Picked up and coiled in Fore Tank ...	= 3·800
Cut off for splices and damaged places ...	= 0·020
Total	= 3·820

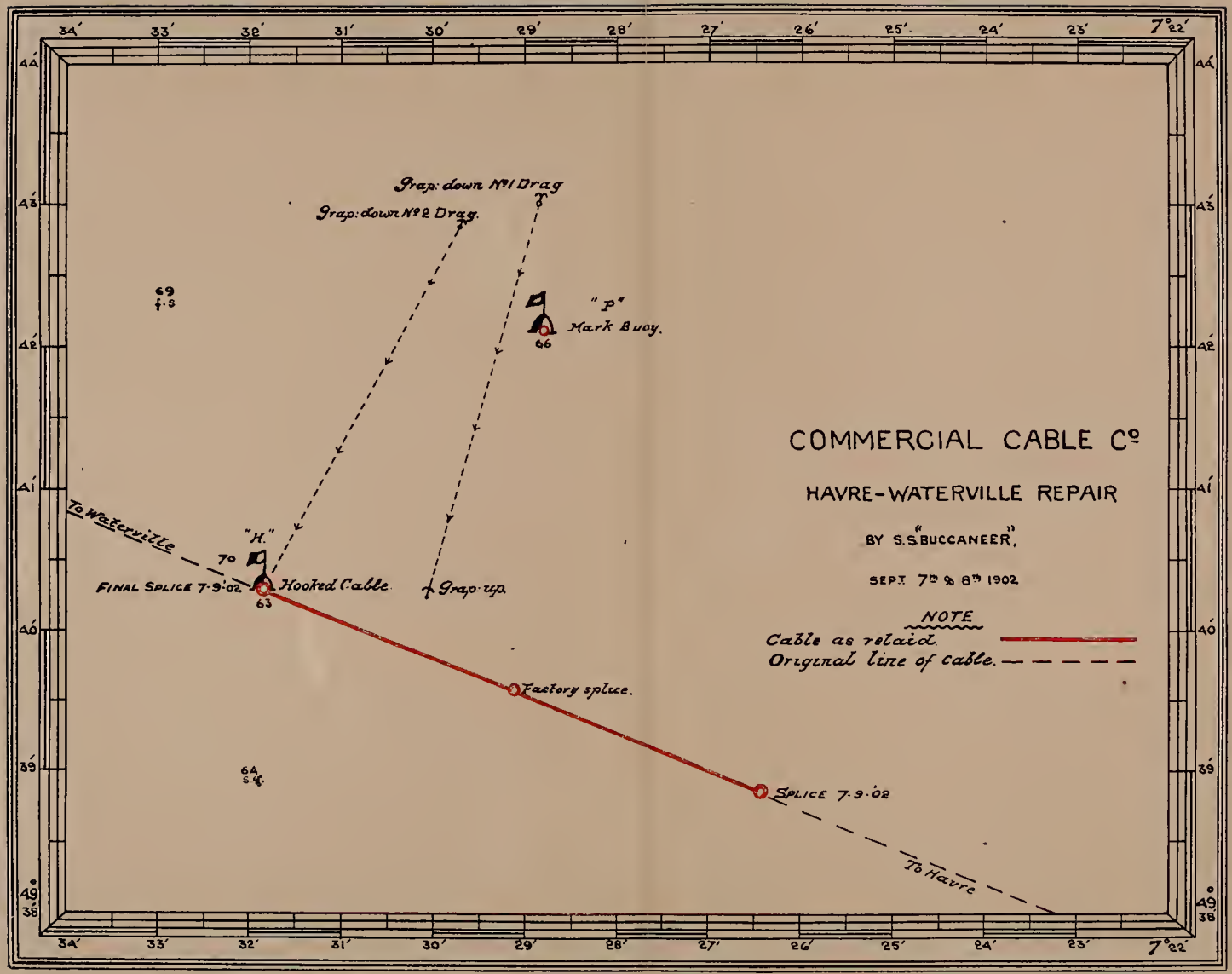
* This Cable was stripped on the 24th inst. and the core forwarded to Mr. Gott.

FACTORY ELECTRICAL VALUES AT 75° FAHR. OF CABLE ON BOARD S.S. "BUCCANEER,"

On her Return to Silvertown Works, September 10th, 1902, after Completion of Havre—Waterville Repairs.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total per N.M.		Total per N.M.		Total per N.M.		
Single Core 70/75					AFTER	TANK.				
8512		* 0·304		5·305	17·451	0·0929	·3054	—	—	Picked up during Repairs, 8.9.02.
„		* 3·398		59·298	17·451	1·0380	·3054	—	—	"Buccaneer," 10.9.02.
„		2·030		34·551	17·02	0·6740	·332	285·7	580	"Buccaneer," 9.9.02.
		5·732		99·154	17·30	1·8049	·3149	285·7	580	
8514		0·915		15·738	17·2	0·3257	0·356	417·5	382	Siemens' Splice.
„		2·992		49·667	16.6	1·0711	0·358	100·9	302	
		3·907		65·405	16·74	1·3968	0·3575	81·2	317·5	
					FORE	TANK.				
Twin Core 8553	No. 1	1·1085	1·1210	14·720	13·13	0·3704	·3304	2132	2390	
	No. 2			14·730	13·14	0·3689	·3291	2618	2935	
8552 Piece 3	Plain 1	0·053	0·054	0·718	13·29	0·0162	·2993	—	—	
	Rib 2			0·716	13·26	0·0159	·2950	—	—	"Buccaneer," 30.7.02.
Piece 2	Plain 1	0·243	0·2457	3·265	13·29	0·0735	·2993	—	—	
	Rib 2			3·258	13·26	0·0725	·2950	—	—	
Piece 1	Plain 1	2·708	2·738	36·389	13·29	0·8196	·2993	—	—	"Buccaneer," 30.7.02.
	Rib 2			36·305	13·26	0·8078	·2950	—	—	
Piece 4	Plain 1	0·050	0·0506	0·6645	13·29	0·0151	·2993	—	—	"Buccaneer," 31.7.02.
	Rib 2			0·6710	13·26	0·0149	·2950	—	—	
		* The above 4 pieces (3, 2, 1, 4 of Type 8552) as spliced up.								
8552 Twin Core	Plain	3·054	3·089	41·037	13·29	0·9244	·2993	—	—	
	Rib			40·950	13·26	0.9111	·2950	—	—	

* Picked up during Repairs to Weston—Waterville (1885) Cable, 25th and 26th July, 1902.


34' 33' 32' 31' 30' 29' 28' 27' 26' 25' 24' 23' 7°22'
44' 43' 42' 41' 40' 39' 49° 38'
Grap: down No1 Drag
Grap: down No2 Drag.
"P" Mark Buoy.
66
69 f.s
"H."
70
To Waterville
FINAL SPLICE 7-9-02
Hooked Cable
63
Grap: up
Factory splice.
64 S.G.
SPLICE 7-9-02
To Havre
COMMERCIAL CABLE Co
HAVRE-WATERVILLE REPAIR
BY S.S. "BUCCANEER"
SEPT 7th & 8th 1902
NOTE
Cable as relaid.
Original line of cable.

Havre—Waterville Cable

AND

Waterville—Canso (1884) Cable

Repairs Expedition.

REPAIRS

TO THE

Havre—Waterville Cable

(Western and Eastern),

AND

Waterville—Canso (1884) Cable.

S.S. "BUCCANEER."

JULY, 1903.

GENERAL INDEX.

Havre—Waterville Cable (Western and Eastern) and Waterville—Canso (1884) Cable Repairs Expedition, July, 1903.

S.S. "BUCCANEER."

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GENERAL REPORT.

GENERAL REPORT.

July 31*st*, 1903.

M. H. Gray, Esq.,

Silvertown.

Dear Sir,

We left Silvertown on Wednesday, July 1st, 8 p.m., Mr. Gott, representing the Commercial Cable Company, having joined the ship there.

There being two faults in the Harve-Waterville section, Mr. Gott instructed us to take out the Western fault first—about 60 N.M. west of Scilly. We arrived in position on Friday, 3rd inst., and on the second drag lifted the cable, which was very taut, and parted at a strain of 50—60 cwts. On the Saturday and Sunday we got both ends and put through Monday morning, the Final Splice being in Lat. 49° 47′·4 N, Lon. 7° 59′·2 W—68 fms. f.s.

The fault was evidently caused by damage by trawler, and while we were on the cable ground there were several working around us.

The original intention was, after taking out this fault, to go to the second fault, off Cape Barfleur, but Mr. Gott received information that there was a fault in the '84 Northern Canso Cable, about 50 N.M. from Waterville, and instructed us to proceed there at once. We arrived at Waterville on the morning of the 7th, and took in some provisions there.

As the South American Cable, No. 2147[A] and 2147, which we were to use on this repair, was at the bottom of after tank and we were unable to get a barge at Waterville to facilitate the turning over, we proceeded to Valencia, and obtaining a hulk there, finished the transferring on the Thursday and left for cable ground about 4 p.m.

The position of fault was given as Lat. 51° 41′·3 N, Lon. 11° 28′·2 W, about 2½ N.M. south of '74 Anglo Cable and 2½ N.M. north of '94 C. C. Co. Cable and 3½ N.M. from where the '84 cable crosses the Anglo.

On 10th and 11th inst. the weather being thick and foggy we were unable to obtain sights to verify position. On the 12th and 13th, thirteen drags were made without success, and on the morning of the 14th as strong S.W. gale and rising sea rendered it unfit for work, we ran into Valencia. Here we heard that the '84 cable, on which we were working, had parted at 10.18 a.m. on Monday, this led us to believe that we had run through it on Drag No. 7—the westermost one.

While in Valencia we took out the faults in the C. C. Co. cable No. 8514. On Thursday, 16th inst., as weather was moderating, we proceeded to Cable Ground, leaving Valencia at 9.20 a.m., and getting both ends in successive drags, put the cable through by 7 p.m. on Friday, 17th, in Lat. 51° 42′·5 N, Lon. 11° 34′·9 W, 219 fms. The fault, which so far has not been exactly located, as it sealed up on coming inboard, is in a 1·178 N.M. piece, now on board "Buccaneer," and is apparently not a mechanical one. The nature of the bottom was hard, no specimen obtained from soundings, but large flint pebbles were brought up jammed in prongs of grapnel and on mushroom.

3·673 N.M. S.A. No. 2174[A] was expended on this repair. I may mention that I heard from the Anglo Co. at Valencia that the "Britannia" last April reported trawlers working in the vicinity of this repair, in 150—200 fms., but we did not see any.

After landing Pilot O'Neill off Waterville we set on for Portland, and taking in there 100 tons of coal and provisions, left on Monday, 20th, for the Eastern Repair of Havre—Waterville Cable, about 10 N.M. north of Cape Barfleur, arriving on the ground the same evening, and completed and put through at 1.15 p.m. on Wednesday, 22nd inst. in Lat. 49° 52′·9 N, Lon. 1° 21′·9 W—40 fms. The

fault proved to be in the original cable on the eastward side of "John Pender's" splice 16.2.02. The old cable was in very bad condition, badly corroded, core exposed in parts, and the broken end brought in had only been holding by four wires, the rest being corroded to needle points. The nature of the bottom here was hard, pieces of broken granite being brought up jammed in grapnel prongs.

The S.S. "Buccaneer" arrived off Works, all well, at 10 a.m. on Thursday, 23rd, and hands were paid off on Friday noon.

I will hand you the Engineering Log and Electrical Log in the course of a few days.

Yours faithfully,

F. C. CRAWFORD.

HAVRE—WATERVILLE CABLE WESTERN REPAIR.

S.S. "BUCCANEER."

JULY, 1903.

LIST OF STAFF, OFFICERS, CABLE HANDS AND CREW.

S.S. "BUCCANEER."

S.S. "BUCCANEER."

LIST OF STAFF, OFFICERS, CABLE HANDS AND CREW.

	Mr. F. C. Crawford	...	Engineer in Charge.
	,, H. E. Cann ...	...	Electrician.
	,, S. E. Marsham	...	Assistant Electrician.
	,, E. H. Walker	...	Accountant.
1.	Mr. B. C. Combe	...	Captain.
2.	,, J. S. Roberts	...	Chief Officer.
3.	,, V. Jones ...	...	2nd ,,
4.	,, A. Clunie ...	...	Aux. 2nd ,,
5.	W. Mackenzie ...	...	Carpenter.
6.	J. Kelly	...	Boatswain.
7.	C. Collins	...	Boatswain's Mate.
11.	4 Quartermasters.		
17.	6 Able Seamen.		
18.	Mr. A. White ...	...	Chief Engineer.
19.	,, W. Macfarlane	...	2nd ,,
20.	,, J. W. Cadman	...	3rd ,,
21.	,, R. Hall ...	...	4th ,,
22.	J. Maguire ...	...	Donkeyman.
23.	A. Gooch	...	Greaser and Electric Light Driver.
29.	6 Firemen.		
33.	4 Trimmers.		
34.	Mr. A. Patrick ...	...	Chief Steward.
35.	B. Dold	...	2nd Steward and Storekeeper.
36.	W. Parsons ...	...	Chief Cook and Baker.
37.	A. Golding ...	...	2nd Cook and Butcher.
38.	J. Rouan	...	Pantryman.
40.	2 Assistant Stewards.		
41.	Engineers' Steward.		
42.	1 Scullion.		
43.	2nd and 3rd Class Caterer.		

CABLE HANDS.

1.	W. Tillyer	Foreman.
2.	B. Butcher	Leading Hand.
3.	C. Cakebread	Cable Hand.
4.	R. Duncan	,, ,,
5.	A. Smith	,, ,,
6.	H. Marshall	,, ,,
7.	A. Harris	,, ,,
8.	W. Mack	,, ,,
9.	H. Livingstone	Fitter.
10.	A. E. Newton	Fitter's Mate.
11.	W. Billington	Jointer.

Representative of the Commercial Cable Company:
Mr. J. Gott.

SUMMARY.

Staff	4
Cable Hands	11
Officers and Crew	43
Visitor	1
Total on board leaving London	59

MECHANICAL DESCRIPTION OF CABLE.

S. S. "BUCCANEER."

MECHANICAL DESCRIPTION OF CABLE.

Siemens' Main Cable, their Factory No. 8512 (Single Core).

Conductor :—Strand of 7 copper wires each ″·023 dia., weighing 70 lbs. per N.M.

Dielectric :—Gutta percha one coat to ″·205 dia., weighing 75 lbs. per N.M.

Serving :—Tanned jute yarn.

Sheathing :—10 B.B.G.I. wires ″·143 dia.

Outer Serving :—Two coats prepared jute yarn alternating with three coats of compound.

Ex. diameter = 2″·875.

Weight in air, dry = 2·138 tons per N.M.
,, ,, wet = 2·175 ,, ,,
,, in sea water = 1·433 ,, ,,

Siemens' L.I. Cable, their Factory No. 8553 (Twin Core).

Conductor :—Solid plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs. per N.M.

Two Cores as above, one marked with "Rib," the other "Plain," laid up, wormed and served with tanned jute yarn.

Sheathing :—15 G. Homo. wires, No. 9 L.S.G. = ″·144 dia. when galvanized.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1″·103.

Weight in air, dry = 3·293 tons per N.M.
,, ,, wet = 3·420 ,, ,,
,, in sea water = 2·241 ,, ,,

Siemens' L.I. Cable, their Factory No. 8513 (Single Core).

Conductor :—Strand of 7 copper wires each ″·023 dia., weighing 70 lbs. per N.M.

Dielectric :—Gutta percha to ″·205 dia., weighing 75 lbs. per N.M.

Serving :—Tanned jute yarn.

Sheathing :—10 B.B.G.I. wires ″·180 dia. when galvanized.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1″·160.

Weight in air, dry = 3·4 tons per N.M.

Siemens' H.I. Cable, their Factory No. 8514 (Single Core).

Core and serving same as in No. 8513.

Sheathing :—10 B.B.G.I. wires ″·238 dia. when galvanized.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1″·393.

Weight in air, dry = 5·437 tons per N.M.
,, ,, wet = 5·526 ,, ,,
,, in sea water = 3·873 ,, ,,

Siemens' Main Cable, their Factory No. 8552 (Twin Core).

Conductor :—Solid plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs. per N.M.

Two Cores as above, one marked with "Rib," the other "Plain," laid up, wormed and served with tanned jute yarn.

Sheathing :—17 G. Homo. wires ″·124 dia. when galvanized.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1″·078.

Weight in air, dry = 2·838 tons per N.M.
,, ,, wet = 2·900 ,, ,,
,, in sea water = 1·798 ,, ,,

Light Deep Sea Cable, No. 2147.

Conductor :—Strand of 7 copper wires each "·0415 dia., weighing 225 lbs. per N.M.

Dielectric :—Gutta percha three coats to "·355 dia., weighing 225 lbs. per N.M.

Serving :—Tanned jute yarn.

Sheathing :—16 galvanized steel wires "·0918 dia. when galvanized.

Outer Serving :—20 hemp cords prepared in compound, alternating with two coats of compound.

Ex. diameter = 1"·039.

Weight in air, dry = 2·145 tons per N.M.
,, ,, wet = 2·16 ,, ,,
,, in sea water = 1·12 ,, ,,

Light Deep Sea Cable, No. 2147a.

Same as the above, with cords stripped off and two compounds and tape on instead.

Intermediate Cable, No. 02664.

Conductor :—Strand of 7 copper wires each "·032 dia., weighing 130 lbs. per N.M.

Dielectric :—Gutta percha three coats to "·355 dia., weighing 130 lbs per N.M. Core brass taped.

Serving :—Tanned jute yarn.

Sheathing :—10 B.B.G.I. wires "·203 dia. when galvanized. Wires pickled in compound.

Outer Serving :—Two laps of tape alternating with two coats of compound.

Ex. diameter = 1"·039.

Weight in air, dry = 3·83 tons per N.M.

DISTRIBUTION OF CABLE ON LEAVING SILVERTOWN, JULY 1ST, 1903.

AFTER TANK.

Type.	Number.	N.M.		Tons.
Main ...	8512 single core ...	2·690	=	5·851
„ ...	„ „ „ ...	1·635	=	3·556
„ ...	„ „ „ ...	0·994	=	2·162
L.I. ...	8553 twin „ ...	1·109	=	3·790
Main ...	8552 „ „ ...	3·054	=	8·860
L.D.S. ...	2147A S.A.	3·673	=	7·900
„ ...	2147 „	10·978	=	23·700
„ ...	„ „	3·000	=	6·500
	TOTAL	= 27·133	=	62·319

FORE TANK.

Type.	Number.	N.M.		Tons.
Int. ...	02664 single core ...	2·000	=	7·66
H.I. ...	8514 „ „ ...	0·500 (SPLICED)	=	2·76
L.I. ...	8513 „ „ ...	0·220 (SPLICED)	=	0·75
H.I. ...	8514 „ „ ...	0·380 (SPLICED)	=	2·10
„ ...	„ „ „ ...	0·901	=	4·98
„ ...	„ „ „ ...	1·639	=	9·06
	TOTAL =	5·640	=	27·31

SUMMARY.

	N.M.		TONS.
After Tank	27·133	=	62·319
Fore Tank	5·640	=	27·310
TOTAL =	32·773	=	89·629

DISTRIBUTION OF WEIGHT IN SHIP ON LEAVING GRAVESEND.

	TONS.
Cable in fore tank	27·31
Ballast ,, ,, ...	Nil.
Cable in after tank	62·32
Ballast ,, ,, ...	Nil.
Coal in bunkers	240·00
Fresh water in after fresh water tank	13·00
,, ,, ,, fore cone	8·00
,, ,, ,, side tanks	4·50
Water in ballast tanks forward	70·00
,, ,, ,, aft.	Nil.
Boatswain's stores forward	0·50
Carpenter's stores	0·10
Cable stores and buoys	11·50
Engine-room stores	3·00
Water in main boilers...	30·00
Steward's stores	9·00
Extra chain cable	1·00
Spare anchors, ropes	2·00
,, propeller	3·00
Deck machinery	10·00
TOTAL =	495·23 tons

Draught { Fore 13′ 4″ / Aft. 14′ 4″ } Mean 13′ 10″

HAVRE—WATERVILLE REPAIR,

JULY, 1903.

S.S. "BUCCANEER."

DRUM CO-EFFICIENTS. Circ. of Drum = 17′ 2½″

Type.	Circ. in inches.	Revs. per N.M.	Log.	Fms. per Rev.
Main 8512 single core ...	2·875	348·867	2·5426596	2·908
H.I. 8514 „ „ (new)...	4·375	346·385	2·5395594	2·929
„ „ „ „ (old)...	4·250	346·590	2·5398169	2·927
L.I. 8553 twin core	3·465	347·886	2·5414375	2·916
Int. 8552 „ ...	3·387	348·016	2·5415988	2·915
L.I. 8513 single core ...	3·650	347·580	2·5410551	2·919
L.D.S. 2147A „ ...	2·953	348·737	2·5424979	2·909
„ 2147 „ ...	3·280	348·193	2·5418204	2·913
Int. 02664 „ ...	3·264	348·220	2·5418535	2·912

HAVRE—WATERVILLE CABLE WESTERN REPAIR.

STEAMING DOWN RIVER FROM SILVERTOWN.

S.S. "BUCCANEER."

STEAMING DOWN RIVER FROM SILVERTOWN.

S.S. "BUCCANEER."

HOUR.	
	WEDNESDAY, JULY 1st (1st DAY OUT).
P.M. 6.30	Mr. Gott, of Commercial Cable Company, came on board with Mr. Crawford.
6.35	Mr. M. H. Gray came on board.
6.50	Commenced unmooring ship.
7.25	Mr. M. H. Gray left ship.
8.8	Cast off moorings and proceeded down river. Pilot Twist in charge.
9.28	Slowed ship off Gravesend. Pilot Twist left and Pilot Lygo boarded. Set on full speed ahead.
11.0	Passed Nore Light Vessel.
11.35	,, Mouse ,, ,,
MID.	Light SE breeze. Fine weather. Hazy horizon. Bar. 30·40. Ther. 75° F.
	THURSDAY, JULY 2nd (2nd DAY OUT).
A M. 0.30	Black Deep Light Ship abeam.
1.15	Tongue ,, ,, ,,
2.15	Elbow Buoy abeam.
3.10	Gull Light Ship ,,
3.12	Half speed. Adjusting compasses.
4.0	South Goodwin Light Ship abeam. Light ESE breeze. Smooth sea. Fine and clear. Bar. 30·20. Ther. 74° F.
5.15	Pilot Lygo left ship off Dover.
5.17	Full speed ahead.
6.0	Dungeness Light abeam.

HOUR.	THURSDAY, JULY 2nd (2nd DAY OUT)—*Contd.*
A.M. 8.0	Light ESE breeze. Fine weather. Hazy horizon. Bar. 30·29. Ther. 64° F.
9.20	Royal Sovereign Light Vessel abeam.
10.0	Beachy Head Lighthouse abeam.
NOON	Light variable breeze. Fine weather. Hazy horizon. Bar. 30·24. Ther. 67° F. Distance run from Gravesend = 140 N.M. Position { Lat 50° 37′ N. Lon. 00° 18′ W.

STEAMING TO CABLEGROUND OFF SCILLY ISLANDS.

P.M. 3.30	St. Catherine's Point abeam.
4.0	Light ESE breeze and smooth sea. Hazy. Bar. 30·02.
8.0	Wind hauling to westward. Overcast and fine. Bar. 30·02.
10.20	Observed Start Point Light.
MID.	Fresh WNW breeze. Clear weather. Bar. 30·13. Ther. 70° F.

Note.—Mr. Gott informed Mr. Crawford to-day that the first fault in the Havre—Waterville cable was approximately 19 N.M. west from "Buccaneer's" final splice on 7.9.02, *i.e.*, { Lat. 49° 47′·2 N. Lon. 7° 59′·0 W.

FRIDAY, JULY 3rd (3rd DAY OUT).

A.M. 0.8	Start Light abeam.
2.40	Eddystone ,,
4.0	Fresh W breeze. Fine and clear. Moderate W'ly swell. Bar. 30·25. Ther. 62° F.
6.23	Observed Lizard Lights.

HOUR.	FRIDAY, JULY 3rd (3rd DAY OUT).—*Contd.*
A.M. 8.0	Moderate WNW breeze, and fine, with head swell. Bar. 30·30. Ther. 66° F.
10.15	St. Agnes abeam.
11.18	Bishop's Rock Lighthouse abeam.
NOON	Fresh WNW breeze. Fine weather. Head swell. Bar. 30·30. Ther. 66° F. Distance run since noon yesterday = 255 N.M. Position { Lat. 49° 49′ N. Lon. 6° 39′ W.
P.M. 4.0	Moderate WNW breeze. Fine and clear. Bar. 30·05. Ther. 63° F.
5.0	Stopped ship and sounded No. 1. 70 fms. Fine sand.
5.5	Preparing to place Mark Buoy { Lat. 49° 45′·4 N. Lon. 7° 52′·1 W.
5.20	Commenced paying out buoy's moorings.
5.30	All moorings paid out, streamed buoy and let go forward. *Buoy's Moorings.*—Buoy No. 41. Flag Blue "B." $\frac{5}{8}$″ bridle, 10 fms. $\frac{3}{4}$″ chain, 50 fms. 4 × 6 rope, 30 fms. $\frac{5}{8}$″ chain, mushroom 4 cwt. 1 qr. 7 lb.
5.40	Lowered and sent boat away to put 2 lamps on buoy.
5.55	Boat returned to ship and was hoisted up. Set on to take some soundings.

ON CABLEGROUND.

6.15	Sounded No. 2—68 fms., sand.
6.40	,, ,, 3—64 ,, ,,
6.55	,, ,, 4—47 ,, ,,
7.12	,, ,, 5—43 ,, ,,
7.30	,, ,, 6—43 ,, n. sn.
7.42	,, ,, 7—52 ,, sand.
7.55	,, ,, 8—70 ,, ,,

HOUR.	FRIDAY, JULY 3rd (3rd DAY OUT)—*Contd.*
P.M. 8.0	Set on back to pick up Mark Buoy, as star sights placed us to eastward of position.
9.15	Up to Mark Buoy. Sent boat with drum rope to dismantle buoy.
9.25	Knocked up tumbler and commenced picking up moorings.
9.30	Hove up buoy and boat.
9.38	All buoy's moorings on board. Set on for new position to place Mark Buoy.
10.30	Sounded No. 9—55 fms., sand. Air temp. 61°; sea bottom 52°·2.
10.45	Sounded No. 10—47 fms., sand.
10.50	In position. Commenced paying out Mark Buoy's moorings.
11.8	All moorings payed out. Streamed buoy, and let go forward. Position { Lat. 49° 50′·1 N. Lon. 7° 59′·5 W. *Buoy's Moorings.*—Buoy No. 47. Flag Red "B." 10 fms. $\frac{5}{8}$″ chain, 5 fms. $\frac{3}{4}$″ chain, 1—15 fms. 4×4 side rope, 30 fms. $\frac{5}{8}$″ chain, mushroom 4 cwt. 1 qr. 7 lb.
11.10	Lowered and sent boat away to put 2 lamps on buoy.
11.30	Boat returned to ship and was hoisted. Set on for position to grapple.
11.55	In position. Lowered ordinary grapnel with 10 fms. $\frac{3}{4}$″ chain, and commenced paying out 4 × 4 rope.
MID.	Moderate WNW breeze. Overcast. Bar. 30·15. Ther. 60° F.
	SATURDAY, JULY 4th (4th DAY OUT).
A.M. 0.10	Ind.=43 revs.=130 fms. of rope paid out. Commenced dragging. Engines used as required.

HOUR. A.M.	SATURDAY, JULY 4th (4th DAY OUT)—*Contd.*
	DRAG No. 1.
0.15	Dynamometer occasionally lifting slightly to pitch of ship.
0.45	,, ,, ,, ,, ,, ,, ,, ,,
1.15	Shortened in rope to 90 fms.
1.30	No strain.
2.0	,, ,,
2.30	Dynamometer occasionally lifting.
3.0	No strain.
3.30	Sounded with Thomson's tube, 55 fms., sand.
3.15	Across line of cable. Commenced picking up grapnel.
3.30	Grapnel at bows. No cable.
4.0	Captain taking sights to verify position.
4.45	In position. Lowered ordinary grapnel with 10 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 4 rope.
	DRAG No. 2.
5.5	Ind. = 40 revs. = 120 fms. of rope paid out. Commenced dragging. Engines used as required.
5.30	Dynamometer occasionally lifting.
5.43	Commenced picking up; indications of cable.
5.58	Grapnel at bows with cable. Strain = 50 cwt.
5.59	Cable carried away at bows. Strain = 50—60 cwt.
6.0	Set on for Mark Buoy to get departure for new position.
6.15	Passed buoy.
6.48	In position. Lowered Silvertown nipping grapnel with 10 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 4 rope.
	DRAG No. 3.
6.54	Ind. = 40 revs. = 120 fms. of rope paid out. Commenced dragging. Engines used as required.

HOUR.	SATURDAY, JULY 4th (4th DAY OUT)—*Contd.*
A.M. 7.0	No strain.
7.45	,, ,, Commenced picking up.
8.4	Grapnel at bows. No cable.
8.9	In position. Lowered grapnel and chain as before, and commenced paying out 4 × 4 rope.
	Drag No. 4.
9.8	Ind. = 38 revs. = 114 fms. of rope paid out. Commenced dragging. Engines used as required.
9.30	No strain.
10.0	,, ,,
10.5	Commenced picking up.
10.12	Grapnel at bows. No cable. Set on for Mark Buoy.
10.32	Mark Buoy abeam. Took departure for new position.
10.50	In position. Lowered short toe ordinary grapnel with 10 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 4 rope.
	Drag No. 5.
10.55	Ind. = 40 revs. = 120 fms. of rope paid out. Commenced dragging. Engines used as required.
11.15	No strain.
11.30	,, ,,
11.45	,, ,,
NOON.	Mod. West breeze, overcast and cloudy. Bar. 30·30. Ther. 64° F. No strain.
P.M. 0.30	,, ,,
0.45	Sounded with Thomson's Tube, 65 fms., n. sn.
0.50	Turned ship round.
0.58	Commenced picking up.

HOUR.	SATURDAY, JULY 4th (4th DAY OUT)—*Contd.*
P.M. 1.4	Grapnel up. No cable.
1.10	Lowered Centipede with 10 fms. $\frac{3}{4}$" and $2\frac{1}{2}$ fms. trail chain, and commenced paying out 4×4 rope.
	DRAG No. 6.
1.20	Ind. = 40 revs. = 120 fms. of rope paid out. Commenced dragging. Engines used as required.
1.30	No strain.
2.0	,, ,,
2.35	Commenced picking up.
2.40	Grapnel at bows. No cable. Set on for Mark Buoy to take departure for new position.
P.M. 3.0	In position. Lowered Centipede with $2\frac{1}{2}$ fms. trail and 10 fms. $\frac{3}{4}$" chain, and commenced paying out 4×4 rope.
	DRAG No. 7.
3.14	Ind. = 40 revs. = 120 fms. of rope paid out. Commenced dragging. Engines used as required.
3.30	No strain.
4.0	,, ,,
4.20	Strain rose steadily to 20 cwt.
4.25	Strain = 20 cwt. Commenced picking up.
4.35	Grapnel at bows with cable.
4.40	Got drum ropes along and secured to both sides of cable.
4.52	Cut cable. Took grapnel inboard and grappling chain off drum.
5.5	Took port drum rope on short piece towards Waterville to drum and commenced picking up.
5.20	Enough cable abaft drum for testing. Opened out end.
5.34	Commenced testing.

HOUR.	SATURDAY, JULY 4th (4th DAY OUT)—*contd.*
P.M. 5.45	Finished testing. Tests proved fault to be close to ship on Waterville end.
5.55	Veered away on short piece (Waterville end).
6.0	Commenced picking up on Havre end.
6.4	Sounded No. 11—67 fms., sand.
6.15	Enough cable abaft drum for testing. *Cut 20 fms. off*, damaged by grapnel.
6.22	Opened out end for testing. Commenced testing.
8.0	Fresh SSW breeze. Overcast and squally, with rain at times. Bar. 30·19. Ther. 66° F.
9.12	Finished testing to Havre.
9.20	Sealed Havre end and prepared to buoy.
9.25	Commenced paying out Havre end with buoy's moorings attached.
9.45	All buoy's moorings on Havre end paid out. Streamed buoy with 1 lamp and let go forward. { Lat. 49° 47′·4 N. Lon. 7° 59′·2 W. *Buoy's Moorings.*—Buoy No. 41, Blue "B," 1 Dioptric lamp and hanger, $\frac{5}{8}$″ bridle, 10 fms. $\frac{3}{4}$″ chain, 50 fms. 4 × 6 rope, 30 fms. $\frac{5}{8}$″, 10 fms. stray, and $2\frac{1}{2}$″ mushroom chain. Mushroom 4 cwt.
9.50	Commenced picking up short piece on Waterville end.
10.0	End of short piece off drum. Set Ind. zero. Coiling cable into fore tank.
10.20	Ind. = 224 revs. = 0·642 N.M. Picked up cable coming very screwy.
10.30	Ind. = 247 revs. = 0·708 N.M. Type 8512. End passed off drum. = *Piece "A."* *Note.*—From 0·642 N.M. to the end (which = 0·066 N.M.) the cable is very screwy and cannot be used.
10.35	Set on to dodge for night between Cable and Mark Buoys.

HOUR.	
	SATURDAY, JULY 4th (4th DAY OUT)—*Contd.*
MID.	Fresh S. breeze. Overcast and squally, with rain at times. Bar. 30·12. Ther. 66 °F.
	SUNDAY, JULY 5th (5th DAY OUT).
A.M. 4.0	Strong S. breeze. Sea increasing. Overcast, rain at times. Bar. 30·10. Ther. 66° F.
6.0	Weather too rough for grappling.
7.20	Got up end of Piece "A" from fore tank for splicing with top piece in after tank. *Cut 0·066* N.M. from Piece "A" which was damaged by the grapnel.
7.40	Commenced opening out both ends.
7.50	*Cut 6 fms.* off Piece "A" for jointing.
10.0	Commenced joint.
11.30	Finished ,,
11.50	Commenced splice.
P.M. 0.55	Finished ,,
1.30	Preparing to grapple. Weather fining. Sea subsiding.
2.0	In position. Lowered Centipede grapnel with $2\frac{1}{2}$ fms. trail chain and 10 fms. $\frac{3}{4}''$ chain, and commenced paying out 4×4 rope.
	Drag No. 8.
2.10	Ind. = 40 revs. = 120 fms. of rope paid out. Commenced dragging. Engines used as required.
2.30	Strain rose steadily to 25 cwt. Commenced picking up.
2.40	Grapnel at bows with cable. Got drum rope along and made fast to bight of cable.
2.45	Took grapnel inboard and grappling rope off drum.
3.0	Took drum rope to drum and hove in on cable. Cut bight of cable forward of drum, and veered away on short end and picked up on Waterville end. End off drum. Set Ind. zero. *Cut 10 fms. off* Waterville end damaged by grapnel.

HOUR.	SUNDAY, JULY 5th (5th DAY OUT)--*Contd.*
P.M.	
3.21	Opened out end and commenced testing to Waterville.
3.45	Turned Piece "A" spliced up this morning from fore to after tank.
3.55	Finished testing. Tests proved fault about 1 N.M. out board.
4.0	Commenced picking up to fault in Waterville end and short end at same time (Approx. 0·5 N.M.).
4.5	End of short piece passed off drum. Ind. = 14 revs. = zero. Coiling short Piece "B" on deck. Waterville end in fore tank.
4.20	Ind. = 38 revs. = 0·109 N.M. Kink in short piece.
4.30	,, = 70 ,, = 0 200 ,, End of short Piece "B" passed off drum. Resumed picking up on Waterville end to fault.
4.45	Ind. = 174 revs. = 0·500 N.M. of Waterville end picked up.
5.0	,, = 312 ,, = 0·894 ,, ,, ,, ,, Bad place passed inboard. Cut cable at this place = Piece "C." This bad place proved to be the fault. Continued tests to Waterville.
5.30	Coiled Piece "B" 0·200 N.M. from deck into fore tank on top of Piece "C" 0·894 N.M.
6.15	Finished testing to Waterville = "O.K." Commenced opening out top end in after tank and Waterville end for splice.
7.10	Commenced joint. *Cut 6 fms. off* Waterville end.
7.50	Finished ,,
8.0	Commenced splice.
9.35	Sounded No. 12—54 fms., sand. Bot. temp. 50° F.; air 58° F.
9.45	Finished splice.
10.12	Commenced paying cable from after tank to Havre buoyed end. Put engine out of gear.
10.20	Swung ship and set on course for buoy.

HOUR.	SUNDAY, JULY 5th (5th DAY OUT)—*Contd.*
P.M. 10.30	Ind.=147 revs.=0·500 N.M. paid out. Strain=nil.
10.33	,, =228 ,, =0·653 ,, ,, ,, Splice between Piece "A"* and Main 8512. (*Paying out length of Piece "A" is 0·011 N.M. in excess to picking up length.)
10.37	Ind.=348 revs.=1·000 N.M. paid out. Strain=nil.
10.45	,, =522 ,, =1·500 ,, ,, ,,
10.50	,, =696 ,, =2·000 ,, ,, ,,
10.53	Approaching buoy. Checking cable with brakes. Engines used as required.
10.57	Lowered boat. Put engine in gear.
11.3	Ind.=764 revs.=2·190 N.M. Put brakes down.
11.10	Sent boat to buoy with heaving line attached to drum rope.
11.20	Commenced picking up some slack of cable paid while manœuvring ship to buoy.
11.24	Stopped picking up cable. Ind.=748 revs.=2·144 N.M.
11.25	Freed buoy from moorings and commenced picking up buoy's moorings by winch.
11.27	Paid out on cable.
11.28	Hove up buoy and boat.
11.47	Ind.=755 revs.=2·164 N.M. Took cable off drum and took buoy's moorings to drum and resumed picking up.
MID.	Fresh WNW breeze and squally, with passing showers. Bar. 30·09. Ther. 69° F. Temp.=69° F. dry, 59° F. wet.
	MONDAY, JULY 6th (6th DAY OUT).
A.M. 0.20	Enough Havre end inboard for splice. Stopped picking up.
0.40	Opened out Havre end and commenced testing.
1.50	Cut Waterville (tank) end 7 fms. abaft drum mark, thus total cable expended=2·164 N.M.+0·007 N.M.=2·171 N.M.

HOUR.	MONDAY, JULY 6th (6th DAY OUT)—*Contd.*
A.M.	
1.55	Sounded No. 13—68 fms., sand. Bot. temp., 54·5° F.; air 58° F.
2.40	Finished testing cable. Gave ends out for splice.
2.45	Commenced opening out ends for splice.
2.50	Commenced joint. *Cut 6 fms. off* Waterville end.
3.40	Finished ,,
4.15	Commenced splice.
5.15	Finished ,,
5.20	Commenced paying out on hanging ropes.
5.25	Cut hanging ropes and slipped splice { Lat. 49° 47′·4 N. Lon. 7° 59′·2 W.
5.30	Decided to wait finer weather before picking up Mark Buoy.
8.0	Strong NNW breeze, high sea and fine weather. Bar. 30·12. Ther. 64° F. Temp.=60° F. dry, 57° F. wet.
9.55	Finer weather. Up to Mark Buoy. Lowered boat and sent her away to dismantle buoy.
10.0	Freed buoy from moorings and commenced picking up.
10.20	Hove up buoy and boat.
	STEAMING TO AND AT WATERVILLE.
10.35	All moorings on board. Set on course for Waterville to repair '84 Northern Cable.
NOON.	Fresh WNW breeze, fine weather, moderate sea. Bar. 30·30. Ther. 62° F. Temp.=68° F. dry, 58° F. wet. Distance run=17 N.M. from time of picking up Mark Buoy.
P.M.	
4.0	Fresh NW breeze, fine weather, sea decreasing. Bar. 30·26. Ther. 68° F. Temp.=68° F. dry, 58° F. wet.
8.0	Similar wind and weather. Bar. 30·42. Ther. 64° F. Temp.=68° F. dry, 59° F. wet.
MID.	Mod. NW breeze, fine clear weather. Bar. 30·34. Ther. 67° F. Temp.=68° F. dry, 58° F. wet.

HOUR.	TUESDAY, JULY 7th (7th DAY OUT).
A.M. 3.55	Bull Light. abeam.
4.0	Light SSW breeze, overcast and misty. Bar. 30·31. Ther. 66° F. Temp. = 62° F. dry, 57° F. wet.
6.0	Stopped off Horse Island, took Pilot O'Neill on board and proceeded to anchorage.
6.50	Let go anchor off Waterville. Draught of ship { Fore 11′ 4″ / Aft. 14′ 0″ } Mean 12′ 8″

HAVRE—WATERVILLE CABLE WESTERN REPAIR.

S.S. "BUCCANEER," JULY, 1903.

EXPENDITURE TABLE.

CABLE PICKED UP.

No. 8512.

0·020 N.M. Cut off Havre end damaged by grapnel, 4.7.03.

0·708 N.M. Piece "A." Of this 0·066 was cut off where damaged by grapnel in Drag 2, 4.7.03.

0 010 N.M. Cut off Waterville end damaged by grapnel, 5.7.03.

0·200 N.M. Piece "B," picked up to where broken (with bad kink in) Drag 2, 4.7.03.

0·894 N.M. Piece "C," picked up to fault, Waterville end.

0·006 N.M. cut off Havre end for FINAL SPLICE.

1·838 N.M.=Total.

CABLE EXPENDED.

No. 8512.

0·642 N.M. Part Piece "A."

0·006 N.M. for splice

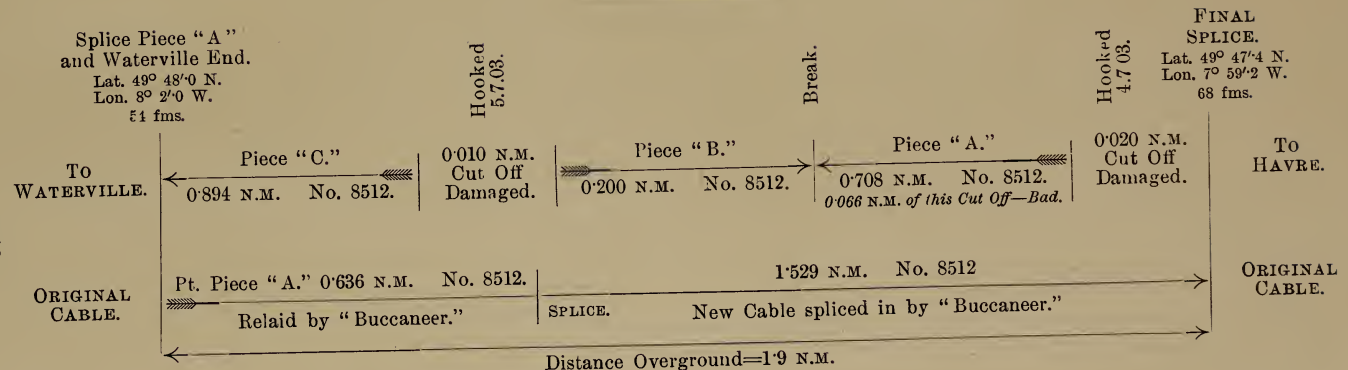
0·636 N.M. on to

1·535 N.M. Cable No. 8512, top piece after tank.

2·171 N.M.=Total.

HAVRE—WATERVILLE WESTERN REPAIR, JULY 3rd—6th, 1903.

S.S. "BUCCANEER."



CABLE RECOVERED.

Piece "A"	=	0·708 N.M.
Piece "B"	=	0·200 ,,
Piece "C"	=	0·894 ,,
Ends Cut Off Damaged, etc.	=	0·036 ,,
TOTAL	=	1·838 N.M.

CABLE EXPENDED ON REPAIR.

Relaid Part Piece "A" ...	=	0·636 N.M.
New Cable, No. 8512	=	1·529 ,,
Cut Off for Splices	=	0·006 ,,
TOTAL	=	2·171 N.M.

TABLE SHOWING CABLE IN SHIP AFTER REPAIR.

AFTER TANK.

Type.	Factory No.	Core.	Length. N.M.	Weight. Tons.
Main	8512	Single	1·155	= 2·512
„	„	„	1·635	= 3·556
„	„	„	·994	= 2·162
L.I.	8553	Twin	1·109	= 3·790
Main	8552	„	3·054	= 8·860
L.D.S.	2147A	S.A.	3·673	= 7·900
„	2147	„	10·978	= 23·700
„	„	„	3·000	= 6·500
		TOTAL =	25·598	= 58·980

FORE TANK.

Type.	Factory No.	Core.	Piece.	Length. N.M.		Weight. Tons.
P.U. Main	8512	Single	"B"	0·200		= 0·435
„ „	„	„	"C"	0·894		= 1·944
Int.	02664	„	—	2·000	SPLICED UP	= 7·660
H.I.	8514	„	—	0·500	SPLICED UP	= 2·760
L.I.	8513	„	—	0·220	SPLICED UP	= 0·750
H.I.	8514	„	—	0·380	SPLICED UP	= 2·100
„	„	„	—	0·901	SPLICED UP	= 4·980
„	„	„	—	1·639	SPLICED UP	= 9·060
			TOTAL =	6·734		= 29·689

SUMMARY.

	N.M.	TONS.
After Tank	25·598	= 58·980
Fore Tank	6·734	= 29·689
TOTAL =	32·332	= 88·669

HOUR.	ANCHORED OFF WATERVILLE AND VALENCIA.
	TUESDAY, JULY 7th (7th DAY OUT)—*Contd.*
A.M. 8.45	Messrs. Gott and Cann left for shore.
8.45	Opened out ends of L.D.S., No. 2147[A], S.A., 3·673 N.M., and No. 2147, S.A., 10·978 N.M., for splice in after tank.
10.5	Commenced joint, cut 9 fms. off 10·978, piece thus reducing this length to 10·969 N.M.
11.25	Finished joint.
11.55	Commenced splice.
NOON	Light variable breeze. Overcast and misty. Bar. 30·30. Ther. 66° F. Temp. 70° F. dry, 61° F. wet.
P.M. 0.50	Messrs. Gott and Cann remained ashore to test and will join ship at Valencia this afternoon.
1.40	Hove up anchor and set on for Valencia.
2.35	Finished splice.
4.0	Mod. W'ly breeze. Misty. Bar. 30·44. Ther. 64° F. Temp. 66° F. dry, 64° F. wet.
4.30	Anchored off Valencia.
6.45	Messrs. Gott, Wilmot (Supt. at Waterville), and Cann came on board.
8.0	Similar wind and weather. Bar. 30·42. Ther. 64° F. Temp. 65° F. dry, 63° F. wet.
8.10	Hulk "Dannebrog" came alongside for receiving cable on board temporarily.
9.30	Commenced transferring cable from after tank to hulk in order to get the S.A. cable on top, 10 labourers from shore assisting cable hands to do this.
MID.	Light airs overcast. Drizzling rain. Bar. 30·40. Ther. 64° F. Temp. 64° F. dry, 63° F. wet.
	WEDNESDAY, JULY 8th (8th DAY OUT).
A.M. 2. 30	Finished transferring Commercial Cable Co.'s cable from after tank to hulk.

HOUR.	WEDNESDAY, JULY 8th (8th DAY OUT)—*Contd.*
A.M.	
4.0	Light NW breeze. Overcast. Fine rain. Bar. 30·38. Ther. 64° F. Temp. 60° F. dry, 59° F. wet.
5.0	Commenced transferring S.A. cable in after tank to fore tank.
	Note.—At 10.45 a.m. the picking up gear was put in use for transferring.
8.0	Light variable breeze. Thick mist. Bar. 30·50. Ther. 65° F. Temp. 62° F. dry, 60° F. wet.
NOON	Light NW breeze. Misty weather. Bright intervals. Bar. 30·54. Ther. 65° F. Temp. 63° F. dry, 61° F. wet.
P.M.	
2.0	Messrs. Gott, Wilmot and Crawford left for shore.
4.0	Light NW breeze, with passing mist. Bar. 30·51. Ther. 68° F. Temp. 62° F. dry, 62° F. wet.
5.15	All S.A. cable coiled in fore tank.
5.45	Commenced transferring Commercial Cable Co.'s cable back from hulk to after tank.
6.50	Messrs. Gott and Crawford returned to ship.
8.0	Light variable breeze. Overcast, misty weather. Bar. 30·50. Ther. 67° F. Temp. 63° F. dry, 60° F. wet.
MID.	Similar wind and weather. Bar. 30·50. Ther. 66° F. Temp. 62° F. dry, 60° F. wet.
	Finished transferring Commercial Cable Co.'s cable back into after tank, and commenced turning back S.A. cable from fore to after tank.
	THURSDAY, JULY 9th (9th DAY OUT).
A.M.	
4.0	Light SE breeze. Overcast and misty. Bar. 30·43. Ther. 62° F. Temp. 62° F. dry, 59° F. wet.
8.0	Similar wind and weather. Bar. 30·40. Ther. 62° F. Temp. 62° F. dry, 59° F. wet.
NOON	Similar wind and weather. Bar. 30·45. Ther. 63° F. Temp. 62° F. dry, 59° F. wet.

WATERVILLE—CANSO (1884) CABLE.

S.S. "BUCCANEER."

TABLE SHOWING CABLE IN SHIP ON LEAVING VALENCIA FOR THE REPAIR.

AFTER TANK.

Type	Factory No.	Core.	Length. N.M.		Weight. Tons.
L.D.S.	2147A	S.A.	3·673 (SPLICED)	=	7·900
„	2147	„	10·969 (SPLICED)	=	23·700
„	„	„	3·000	=	6·500
Main	8512	Single	1·161	=	2·512
„	„	„	1·635	=	3·556
„	„	„	0·994	=	2·162
L.I.	8553	Twin	1·109	=	3·790
Main	8552	„	3·054	=	8·860
		TOTAL	25·595	=	58·980

FORE TANK.

Type.	Factory No.	Core.	Length. N.M.		Weight. Tons.
Int.	02664	Single	2·000	=	7·660
H.I.	8514	„	0·500 (SPLICED)	=	2·760
L.I.	8513	„	0·220 (SPLICED)	=	0·750
H.I.	8514	„	0·380 (SPLICED)	=	2·100
„	„	„	0·891 (SPLICED)	=	4·924
„	„	„	1·638 (SPLICED)	=	9·060
		TOTAL	5·629	=	27·254

SUMMARY.

	N.M.		TONS.
After Tank	25·595	=	58·980
Fore Tank	5·629	=	27·254
TOTAL	31·224	=	86·234

Picked-up Cable in Fore Hold.—Piece "C," No. 8512, Single Core=0·894 N.M.=1·944 tons; and Piece "B," No. 8512, Single Core=0·200 N.M.=0·435 tons.

HOUR.	STEAMING TO CABLEGROUND TO REPAIR WATERVILLE—CANSO '84 NORTHERN CABLE.
	THURSDAY, JULY 9th (9th DAY OUT)—*Contd.*
P.M.	
2.30	Finished transferring S.A. cable from fore to after tank.
3.55	Anchor up and proceeded to cableground, Pilot O'Neill accompanying ship to sea.
4.0	Light SSW breeze, overcast and misty. Bar. 30·44. Ther. 65° F.
4.44	Bray Hd. abeam.
5.25	Thick mist—"Slow."
8.0	Light SSW breeze, smooth sea, with fog. Bar. 30·44. Ther. 65° F.
9.19	Stopped and Sounded No. 14—125 fms., dark sand. Preparing to put down Mark Buoy.
9.38	Commenced paying out buoy's moorings.
10.0	All moorings paid out, streamed buoy and let go forward.
10.3	Lowered boat and sent her away to put 2 lamps on Buoy.
10.15	Boat returned to ship and was hoisted up.
	Buoy's Moorings.—Buoy No. 41, "K" flag, 2 lamps and hanger, $\frac{5}{8}$" bridle, 10 fms. $\frac{3}{4}$" chain, 90 fms. 3 × 3, and 50 fms. 4 × 6 rope, 30 fms. $\frac{5}{8}$" chain. Mushroom 4 cwt. 1 qr. 5 lb.
10.25	Stopped and Sounded No. 15—125 fms., hard bottom.
10.43	,, ,, ,, ,, 16—138 ,, ,,
11.16	,, ,, ,, ,, 17—155 ,, ,,
11.30	Set on to dodge on and off Mark Buoy for night.
MID.	*Note.*—Mr. T. Wilmot (son of Supt. at Waterville), joined ship this morning and will stay on board during the repair.
	ON CABLEGROUND.
	FRIDAY, JULY 10th (10th DAY OUT).
A.M.	
4.0	Light SW wind, thick and misty. Bar 30·45. Ther. 66° F. Dodging ship off Mark Buoy.

HOUR.	FRIDAY, JULY 10th (10th DAY OUT)—*Contd.*
A.M.	
8.0	Owing to the misty weather no position could be obtained, so cable operations had to be abandoned. Light SW wind, with fog very thick at times. Bar. 30·47. Ther. 67° F. Temp. 68° F. dry, 59° F. wet.
	No. of Ther. 16906 90284
9.30	Sounded No. 18T—129 fms., n. sn. 2 thers., bot. temp. 50°·5 and 50°·8
10.8	,, No. 19T—133 fms., n. sn. 2 thers., bot. temp. 50°·5 ,, 50°·8
11.10	,, No. 20T—120 fms., n. sn. 2 thers., bot. temp. 50°·4 ,, 50°·9
11.42	,, No. 21T—120 fms., n. sn. 1 ther., bot. temp. 50°·6
NOON	Fog too thick to permit of cable work. Similar wind and weather. Bar. 30·48. Ther. 70° F. Temp. 72° F. dry, 61° F. wet.
P.M.	No. of Ther. 16906
1.26	Sounded No. 22T—110 fms., n. sn. 1 ther., bot. temp. 50°·5
2.7	,, ,, 23T—101 ,, ,, ,, ,, ,, 50°·5
2.37	,, ,, 24T—99 ,, ,, ,, ,, ,, 50°·5
4.0	Light SW breeze, very foggy. Bar. 30·42. Ther. 68° F. Temp. 72° F. dry, 61° F. wet.
5.15	Lowered boat and sent her away to put fresh lamps and small beacon on buoy.
5.30	Boat returned to ship and was hoisted up.
8.0	Calm, very foggy. Bar. 30·41. Ther. 70° F. Temp. 70° F. dry, 60° F. wet. Preparing to anchor ship with Mushroom and 4 × 4 rope, fog being too thick to keep buoy in sight.
8.20	Commenced paying out on *Moorings*.—Mushroom 4 cwt. 20 fms. $\frac{3}{4}$″ chain and 4 × 4 rope.
8.45	Paid out 300 fms. of rope; put on rounding to await clearer weather.
MID.	Weather clearing up a little. Light breeze springing up from NW, calm sea. Bar. 30·43. Ther. 72° F. Temp. 70° F. dry, 60° F. wet.

HOUR.	SATURDAY, JULY 11th (11th DAY OUT).
A.M.	
4.0	Light NE breeze. Overcast. Smooth sea. Bar. 30·36. Ther. 69° F. Temp. 61° F. dry, 59° F. wet.
8.0	Mod. NE breeze. Overcast, with thick fog at times. Bar. 30·38. Ther. 68° F. Temp. 68° F. dry, 59° F. wet.
9.30	Hove up mushroom, and set on to cruise round Mark Buoy.
NOON.	Fresh NNE breeze. Overcast. Clear weather. Bar. 30·35. Ther. 69° F. Temp. 69° F. dry, 59° F. wet. No sights obtained. Unable to do any cable work.
P.M.	
2.10	Set on full speed to run distance to Skelligs from buoy.
4.0	Fresh NNE breeze. Cloudy. Considerable sea from NE. Bar. 30·33. Ther. 68° F. Temp. 69° F. dry, 59° F. wet.
4.48	Sighted Skelligs. Turned ship round and set on back for Mark Buoy.
7.0	Up to Mark Buoy. Slowed down to dodge.
8.0	Similar wind and weather. Bar. 30·31. Ther. 69° F. Temp. 69° F. dry, 59° F. wet.
MID.	Similar wind and weather. Bar. 30·33. Ther. 68° F. Temp. 67° F. dry, 59° F. wet.
	SUNDAY, JULY 12th (12th DAY OUT).
A.M.	
4.0	Fresh NNE breeze. Considerable sea. Cloudy and fine. Bar. 30·30. Ther. 67° F. Dodging on and off Mark Buoy "K."
NOON.	Mod. NNE breeze. Fine and clear. Bar. 30·32. Ther. 68° F. Temp. 58° F. dry, 56° F. wet. Obtained position by sights.
P.M.	
1.45	Lowered boat and sent her to put fresh lights on Mark Buoy "K."
2.0	Boat returned and was hoisted up. Set on to put down a second Mark Buoy.
2.38	In position. Commenced paying out buoy's moorings.

HOUR. P.M.	SUNDAY, JULY 12th (12th DAY OUT).—*Contd.*
2.55	All moorings paid out. Streamed buoy, and let go forward. *Buoy's Moorings.*—Buoy 54, Flag "T," 1 lamp and hanger, $\frac{5}{8}$" bridle, 10 fms. $\frac{5}{8}$" chain, 200 fms. 3 × 4 rope, 20 fms. $\frac{5}{8}$" chain. Mushroom 3 cwt. 0 qr. 14 lb.
2.56	Lowered boat and sent her away to put lamp on buoy.
2.58	Sounded No. 25—154 fms., n.sn.
3.6	Boat returned to ship and was hoisted up. Set on for position to grapple.
4.0	Mod. NNE breeze. Fine and clear. Bar. 30·31. Ther. 67° F. Temp. 58° F. dry, 57° F. wet.
4.10	In position to grapple. Lowered Centipede with 10 fms. of $\frac{3}{4}$" chain and $2\frac{1}{2}$ fms. trail chain, and commenced paying out 4 × 4 rope.
	DRAG No. 1.
4.20	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on, and commenced drag. Engines used as required.
5.0	No strain.
5.25	Commenced picking up.
5.43	Grapnel at bows. No cable. Set on for new position to lower again.
5.52	In position. Commenced lowering as on Drag. No. 1.
	DRAG No. 2.
6.5	Ind. = 100 rev. = 300 fms. of rope paid out. Put rounding on, and commenced drag. Engines used as required.
6.30	No strain.
7.11	Strain rose to 18 cwt. Commenced picking up.
7.16	Stopped picking up. 258 fms. out. Strain fell.
7.55	Paid out to 300 fms. again.
8.0	Moderate NNW breeze, and sea with squally appearance. Bar. 30·30. Ther. 64° F. Temp. 65° F. dry, 60° F. wet.

HOUR.	SUNDAY, JULY 12th (12th DAY OUT).—*Contd.*
P.M. 8.2	Strain rose to 18 cwt. and fell again to zero.
8.30	No strain. Commenced picking up.
8.41	Grapnel at bows. No cable.
8.47	Swung ship round and lowered as on Drag No. 2.
	Drag No. 3.
9.0	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
10.0	No strain.
11.0	Commenced picking up. No strain.
11.7	Grapnel at bows. No cable.
11.30	Swung ship round, and lowered as on Drag No. 2.
	Drag No. 4.
11.45	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
MID.	Fresh NNW breeze, and squally. Bar. 30·30. Ther. 66° F. Temp. 69° F. dry, 60° F. wet.
	MONDAY, JULY 13th (13th DAY OUT).
A.M. 0.30	No strain.
1.0	No strain.
1.30	Commenced picking up. No strain.
1.40	Grapnel at bows. No cable. Shackled on a long toe grapnel with the centipede now being used.
2.15	Lowered centipede and long toe ordinary grapnels ($2\frac{1}{2}$ fms. $\frac{3}{4}$" chain between each), with 10 fms. $\frac{3}{4}$" chain, and commenced paying out 4×4 rope.
	Drag No. 5.
2.30	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
3.0	Strain rose to 18 cwt. steadily. Commenced picking up.

HOUR.	MONDAY, JULY 13th (13th DAY OUT).—*Contd.*
A.M. 3.12	Grapnel off bottom. Strain fell to nil.
3.20	Grapnel at bows. No cable. Changed long toe ordinary to short toe ditto.
4.0	Mod. NW breeze, and fine clear weather. Bar. 30·24. Ther. 66° F. Temp. 68° F. dry, 58° F. wet.
4.3	Lowered centipede, and short toe ordinary grapnels ($2\frac{1}{2}$ fms. $\frac{3}{4}$" chain between each), with 10 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 4 rope.
	DRAG No. 6.
4.12	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
4.34	Strain rose to 18 cwt. (unsteady).
5.0	Strain rising and falling occasionally.
6.0	,, ,, ,, ,,
7.0	,, ,, ,, ,,
7.42	Commenced picking up.
7.52	Grapnels at bows. No cable. Set on for mark buoy "T," to make a new departure.
8.0	Mod. NW wind and sea. Overcast. Bar. 30·28. Ther. 66° F. Temp. 64° F. dry, 60 F. wet.
8.20	Rounded buoy and set on to run 2 N.M. to position to grapple.
8.37	In position. Lowered as in Drag No. 6.
	DRAG No. 7.
8.45	Ind. = 102 revs. = 306 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
9.0	No strain.
10.0	No strain.
10.51	Commenced picking up.

HOUR.	MONDAY, JULY 13th, (13th DAY OUT)—*Contd.*
A.M. 11.4	Grapnel at bows. No cable. Substituted a long toe for a short toe ordinary.
11.15	Lowered centipede and long toe ordinary grapnels as before and commenced paying out 4 × 4 rope.
	DRAG No. 8.
11.22	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
11.50	Strain rising and falling occasionally.
NOON.	Light NW breeze. Overcast. Mod. sea. Bar. 30·27. Ther. 65° F. Temp. 66° F. dry, 62° F. wet.
P.M. 0.10	Strain rose to 18 cwt. (steady). Commenced picking up.
0.20	Picked up to 150 fms. (grapnel off bottom). Strain fell to Nil. Paid out again to 300 fms. and resumed drag.
1.0	Strain rose to 30 cwt. Commenced picking up.
1.20	Grapnel at bows, no cable.
1.28	Lowered as before in Drag No. 8.
	DRAG No. 9.
1.40	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
2.0	No strain.
2.25	Strain rose to 25 cwt. Commenced picking up.
2.45	Grapnel at bows, no cable. A stone came up on centipede grapnel.
2.55	Lowered as before in Drag No. 9.
	DRAG No. 10.
3.5	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
3.25	Strain rose to 20 cwt. Commenced picking up.

HOUR.	MONDAY, JULY 13th (13th DAY OUT)—*Contd.*
P.M.	
3.33	Grapnels off bottom. Strain fell to Nil.
3.42	Paid out again to 300 fms. of rope and resumed drag.
4.0	Light NW air and overcast. Moderate sea. Bar. 30·21. Ther. 71° F. Temp. 65° F. dry, 63° F. wet.
4.20	Strain rose to 30 cwt. Commenced picking up.
4.34	Grapnel at bows, no cable.
4.44	Lowered as before in Drag No. 10.
	DRAG No. 11.
4.55	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
5.30	No strain.
6.30	Strain rising and falling occasionally.
8.0	Mod. NW wind and sea overcast. Bar. 30·20. Ther. 67° F. Temp. 65° F. dry, 61° F. wet.
8.10	No strain. Commenced picking up.
8.15	Grapnel at bows, no cable. Set on to light up both buoys.
8.20	Lit up Mark Buoy "T." Set on for Mark Buoy "K."
9.10	,, ,, ,, "K."
9.35	In position to grapple. Lowered as before.
	DRAG No. 12.
9.47	Ind. = 100 revs. = 300 fms. of rope paid out. Commenced drag. Engines used as required.
10.0	No strain.
11.0	No strain. Commenced picking up.
11.37	Grapnel at bows, no cable.
11.40	Lowered centipede with usual chain and rope.

HOUR	MONDAY, JULY 13th (13th DAY OUT)—*Contd.*
	DRAG No. 13.
P.M. 11.50	Ind. = 100 revs. = 300 fms. of rope paid out. Commenced drag. Engines used as required.
MID.	No strain. Fresh SW wind. Increasing sea.
	TUESDAY, JULY 14th (14th DAY OUT).
A.M. 2.0	No strain. Bar. 30·12. Ther. 66° F. Temp. 72° F. dry, 61° F. wet
4.0	No strain. Strong SW wind and sea increasing.
5.20	No Strain. Commenced to pick up.
5.40	Grapnel at bows.
6.0	Weather too bad to continue grappling.
8.0	Mod. SW gale. High sea. Thick. Raining. Bar. 29·91. Ther. 63° F. Temp. 60° F. dry, 57° F. wet.
9.40	Set on for Valencia. Wind and sea increasing.
NOON	Similar conditions. Bar. 29·88. Ther. 65° F. Temp. 69° F. dry, 59° F. wet.
P.M. 2.20	Anchored in Valencia Harbour.
4.0	Strong SW wind and raining. Bar. 29·84. Ther. 67° F. Temp. 70° F. dry, 60° F. wet. Mr. Crawford went ashore to go to the Anglo-American Telegraph Co.'s Station.
5.40	Mr. Crawford returned to ship.
8.0	Similar wind and weather. Bar. 29·82. Ther. 67° F. Temp. 70° F. dry, 60° F. wet. Mr. T. Wilmot left ship for Waterville, his home.
MID.	Strong SW breeze, and squally, heavy rain at times. Bar. 29·70. Ther. 67° F. Temp. 72° F. dry, 62° F. wet.
	WEDNESDAY, JULY 15th (15th DAY OUT).
A.M. 4.0	Mod. SW gale, with hard squalls of wind and rain. Bar. 29·70. Ther. 66° F. Temp. 68° F. dry, 60° F. wet.

HOUR.	WEDNESDAY, JULY 15th (15th DAY OUT)—*Contd.*
A.M. 5.0	Commenced turning over cable from fore tank to fore hold in order to cut out a fault in the spliced-up section 1·100 N.M. from the top.
8.0	Similar wind and weather. Bar. 29·72. Ther. 67° F. Temp. 64° F. dry, 60° F. wet.
NOON.	Strong SW wind and squally, overcast with fine rain. Bar. 29·76. Ther. 67° F. Temp. 71° F. dry, 61° F. wet.
P.M. 3.0	Capt. Combe and Mr. Crawford left for shore.
4.0	Strong SSE wind and squally, with heavy rain. Bar. 29·72. Ther. 66° F. Temp. 69° F. dry, 61° F. wet. Stopped turning over cable and cut 10 fms. out with fault. This fault was at the splice between H.I. 8514 single core 0·380 N.M. and 0·901 N.M., the latter length now being 0·891 N.M.
5.0	Commenced turning back the cable from fore hold into fore tank.
7.0	Finished turning back cable for the day.
8.0	Mod. WNW breeze, cloudy and overcast. Bar. 29·72. Ther. 69° F. Temp. 65° F. dry, 62° F. wet.
MID.	Similar wind and weather. Bar. 29·72. Ther. 69° F. Temp. 65° F. dry, 62° F. wet.

ORDER OF CABLE NOW IN FORE TANK AND HOLD.

Fore Hold.

Top, Piece "C," No. 8512, 1 core = 0·894 N.M. Havre—Waterville, 5.7.03.

Bot., Piece "B," No. 8512, 1 core = 0·200 N.M. Havre—Waterville, 5.7.03.

Fore Tank.

Top, H.I., No. 02664, 1 core = 2·000 N.M.

H.I., ,, 8514, ,, = 0·500 ,,
L.I., ,, 8513, ,, = 0·220 ,,
H.I., ,, 8514, ,, = 0·380 ,,
} Spliced up.

Fault cut out here = 0·009 N.M.

H.I., ,, ,, ,, = 0·891 ,,
H.I., ,, ,, ,, = 1·638 ,,
} Spliced up.

HOUR.

THURSDAY, JULY 16th (16th DAY OUT).

A.M.

4.0 Calm, cloudy and fine. Resumed turning back cable to fore tank.
Bar. 29·60. Ther. 62° F. Temp. 65° F. dry, 62° F. wet.

7.45 Mr. Marsham left ship and will proceed to London (overland), acting on instructions received from Mr. M. H. Gray yesterday.

8.0 Similar wind and weather. Finished turning back cable.
Bar. 29·65. Ther. 70° F. Temp. 70° F. dry, 66° F. wet.

9.0 Capt. Combe and Mr. Crawford returned to ship.

9.20 Hove up anchor and set on for cableground.

11.10 Skelligs Lt. Ho. abeam, dist. 1·3 N.M., set course S 81° W.

NOON. Mod. SW wind, fine and clear.
Bar. 29·65. Ther. 70° F. Temp. 71° F. dry, 60° F. wet.

P.M.

2.20 Observed Mark Buoy "K" with flagstaff and lamps gone, and thought to be out of position.

2.30 Up to buoy, sent boat to dismantle it.

2.35 Knocked up tumbler and commenced picking up moorings.

2.40 Hoisted buoy and boat.

ON CABLEGROUND.

2.50 End of rope (buoy's moorings) came on board, having broken at kink, thus losing 50 fms. 4 × 6 rope, 30 fms. $\frac{5}{8}$" chain, mushroom 4 cwt. 1 qr. 5 lb.; also flag "K," staff and 2 Dioptric buoy lamps lost off buoy.

2.55 Set on for Mark Buoy "T." Observed the lamp was ruined.

3.15 Up to buoy. Sent boat to put fresh lamp on same.
Sounded No. 26—162 fms., n. sn.

3.20 Boat returned and was hoisted up. Set on to place another Mark Buoy in place of Mark Buoy "K."

4.0 Light SW. Cloudy, but clear.
Bar. 29·60. Ther. 70° F. Temp. 68° F. dry, 60° F. wet.

HOUR. P.M.	THURSDAY, JULY 16th (16th DAY OUT).—*Contd.*
4.4	Sounded No. 27—153 fms., h. n. sn. In position to place Mark Buoy. Commenced paying out moorings.
4.20	All moorings paid out. Streamed buoy, and let go forward. *Buoy's Moorings.*—Buoy No. 47, Flag Blue "B," 2 Dioptric lamps and hangers, 20 fms. $\frac{3}{4}$" chain, 90 fms. 3 × 4 and 100 fms 4 × 4 rope, 15 fms. $\frac{3}{4}$" chain. Mushroom 4 cwt.
4.25	Sent boat to put lamps on buoy.
4.35	Boat returned and was hoisted up. Set on to run distance between buoys.
5.20	In position to grapple.
5.23	Lowered centipede with 10 fms. $\frac{5}{8}$" chain and $2\frac{1}{2}$ fms. trail chain, and commenced paying out 4 × 4 rope.
	DRAG No. 14.
5.30	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
5.50	Strain rose steadily to 18 cwt. Commenced to pick up. 200 fms. of rope out. Strain = 22 cwt. 100 „ „ „ „ „ = 20 „
6.15	Grapnel at bows with cable (17 wires and taped). Got drum ropes along and secured to each side of cable.
6.35	Cut cable.
6.45	Hove in enough cable on Waterville (short) end for testing.
6.57	Commenced testing.
7.9	Tests showed this to be a short piece.
7.15	Veered away on short end towards Waterville and picked up on Canso end for testing.
8.0	Similar wind and weather. Bar. 29·57. Ther. 70° F. Temp. 67° F. dry, 61° F. wet.

HOUR.	THURSDAY, JULY 16th (16th DAY OUT).—*Contd.*
P.M. 8.5	Took Canso end off drum and took short piece to drum and commenced heaving on board. End off drum. Set indicator = Zero.
8.20	End of short piece passed off drum. Ind. = 55 revs. = 0·157 N.M. = *Piece "G."* *Note.*—Piece "G" has several broken wires, which are worn to needle points.
8.37	Put turns of Canso end on drum and commenced picking up to fault.
10.37	Ind. = 411 revs. = 1·178 N.M. Picked up cut cable and made fresh tests. Fault supposed to be inboard.
11.30	Fault found still to be outboard. Resumed picking up to fault. *Note.*—The above 1·178 N.M. piece has three broken wires, and was not relaid = *Piece "H."*
MID.	Light SW wind. Overcast. Bar. 29·57. Ther. 70° F. Temp. 70° F. dry, 60° F. wet.
	FRIDAY, JULY 17th (17th DAY OUT).
A.M. 0.20	Ind. = 596 revs. = 1·708 N.M. Picked up on Canso end. Stopped picking up, and made fresh tests. These tests proved cable to be "O.K." to Canso.
1.25	Preparing to pay out again on Canso end to last cut.
1.30	Commenced paying out to last cut = 0·503 N.M.
2.10	All cable to cut paid out. Commenced paying out buoy's moorings attached to end of cable.
2.45	All moorings paid out. Streamed buoy and let go forward. *Buoy's Moorings.*—Buoy No. 42, Flag "N," 1 lamp and hanger, $\frac{3}{4}$" bridle, 20 fms. $\frac{3}{4}$" chain, 200 fms. 3 × 4 rope, 30 fms. $\frac{3}{4}$" chain. Mushroom 3 cwt. 1 qr. 7 lb.
2.50	Sent boat away to put lamp on buoy.
3.0	Boat returned to ship. Set on for position to grapple Waterville end.
3.52	In position, lowered as in Drag No. 14.

HOUR. A.M.	FRIDAY, JULY 17th (17th DAY OUT).—*Contd.*
	DRAG No. 15.
4.0	Calm and clear. Bar. 29·56. Ther. 69° F. Temp. 65° F. dry, 61° F. wet.
4.5	Ind. = 100 revs. = 300 fms. of rope paid out. Put rounding on and commenced drag. Engines used as required.
4.30	Strain rose steadily to 18 cwt. Commenced picking up.
4.48	Grapnel at bows with cable. Got drum ropes along and secured to both sides of cable.
5.0	Cut cable.
5.10	Hove enough Waterville end abaft drum for testing.
5.21	Commenced testing. Got Waterville "O.K."
6.40	Got up end of S.A. 2147[A] cable from after tank for splice with Waterville end, and commenced opening out same. Finished testing to Waterville. Gave ends out. Commenced opening out same.
8.0	Similar wind and weather. Bar. 29·58. Ther. 71° F. Temp. 68° F. dry, 64° F. wet.
8.30	Commenced joint.
9.20	Hove in short piece towards Canso = Piece "K" = 0·083 N.M.
10.2	Sounded No. 27—156 fms., h. n. sn. Bottom temperature 50°·6 F.
10.30	Finished joint. Lat. 51° 40′·7 N. Lon. 11° 30′·6 W. 156 fms.
11.0	Commenced splice.
11.45	Finished splice. Put engine out of gear.
11.55	Commenced paying out S.A. cable from after tank to Canso buoyed end. Splice passed off drum. Ind. = Zero.
NOON.	Light variable breeze, fine and clear. Bar. 28·55. Ther. 72° F. Temp. 70° F. dry, 64° F. wet.

HOUR. P.M.	FRIDAY, JULY 17th (17th DAY OUT).—*Contd.*
0.10	Ind. = 348 revs. = 1·00 N.M. of rope paid out. No strain.
0.30	,, 696 ,, 2·00 ,, ,, ,, ,,
0.45	,, 1044 ,, 3·00 ,, ,, ,, ,,
0.55	Approaching Canso buoyed end. Lowered boat and sent her with drum rope to dismantle buoy. Put engine in gear.
1.0	Knocked up tumbler and commenced picking up buoy's moorings by winch.
1.8	Hoisted buoy and boat.
	Ind. = 1184 revs. = 3·394 N.M. of rope paid out. Put stoppers on and took turns of cable off drum.
1.15	Took buoy's moorings on Canso end to drum, and resumed picking up on same.
1.20	Strain rose to 40 cwt. Commenced veering away on Waterville (tank) end accordingly.
2.5	Canso end abaft drum. Amount of tank end veered away = 0·279 N.M.
2.18	Commenced testing to Canso.
2.45	Finished testing to Canso = "O.K." Gave out end for opening out for splice. Cut Waterville (tank) end.
3.32	Gave out Waterville (tank) end, for splice and commenced opening out same for final splice.
4.0	Commenced joint. Similar wind and weather. Bar. 29·63. Ther. 74° F. Temp. 73° F. dry, 63° F. wet.
5.50	Finished joint.
6.0	Commenced splice.
6.5	Sounded No. 28—219 fms., h. n. sn. Bot. temp. 50° F.
7.0	Finished splice { Lat. 51° 42′·5 S. / Lon. 11° 34′·9 W. } 219 fms. Final splice
7.10	Commenced veering away on hanging ropes.

HOUR.

FRIDAY, JULY 17th (17th DAY OUT).—*Contd.*

P.M.
7.14 Cut hanging ropes and let go final splice, thus completing the repair to the Waterville—Canso Northern Cable. Set on to pick up Mark Buoys "B" and "T."

CABLE PICKED UP.

No. 8502.

0·157 N.M.	Piece "G"—	Loose end, after getting Canso Drag 14, has several broken wires.
1·178 ,,	,, "H"—	Picked up to fault in Canso end, has 3 places with broken wires.
0·083 ,,	,, "K"—	Loose end after getting Waterville Drag 15.
0·008 ,,		Cut off for splice Waterville end for splice with cable in after tank.

1·426 N.M. = Total cut out of section and in fore tank.

CABLE EXPENDED.

No. 2147A.

3·394 N.M.	Paid out by indicator.
0·271 ,,	Veered away while picking up Canso end.
0·008 ,,	Cut off tank end for splice with Canso end.

3·673 N.M. = Total cable expended on repair from after tank.

Note.—The expended cable was cut at a splice between the L.D.S 2147A S.A. 3·672 and
,, 2147 ,, 10·969.

The amount of cable No. 8502 abandoned, as agreed with Mr. Gott, being 1·774 N.M. approximate.

WATERVILLE—CANSO NORTHERN (1884) CABLE REPAIR.

S.S. "BUCCANEER." JULY 17th, 1903.

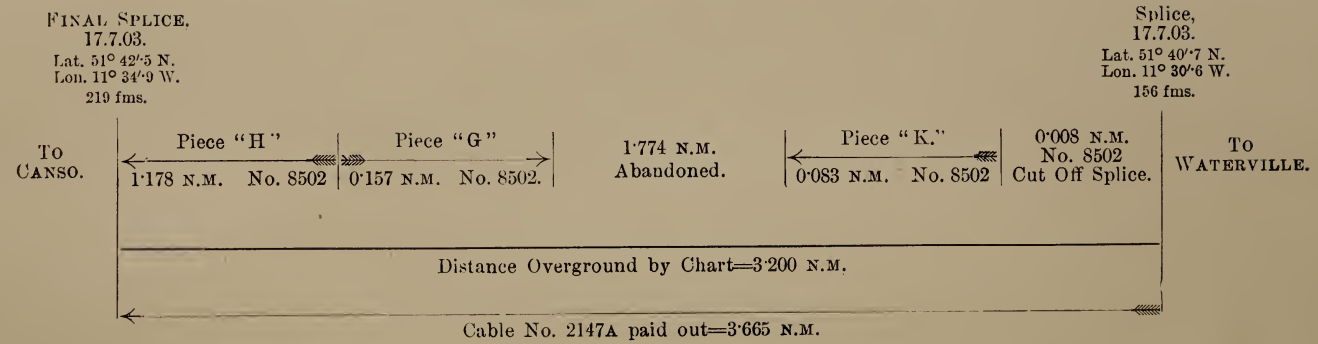


TABLE SHOWING CABLE IN SHIP AFTER REPAIR.

AFTER TANK.

Type.	Factory No.	Core.	Length. N.M.	Weight. Tons.
L.D.S.	2147	S.A.	10·969 =	23·700
„	„	„	3·000 =	6·500
Main	8512	Single	1·161 =	2·512
„	„	„	1·635 =	3·556
„	„	„	0·994 =	2·162
L.I.	8553	Twin	1·109 =	3·790
Main	8552	„	3·054 =	8·860
		TOTAL =	21·922 =	51·080

FORE TANK.

Type.	Factory No.	Core.	Piece.		Length. N.M.	Weight. Tons.
Main	8502	Single	"K"	PICKED UP	0·083	= 0·196
„	„	„	"H"	PICKED UP	1·178	= 2·790
„	„	„	"G"	PICKED UP	0·157	= 0·371
Int.	02664	„	—		2·000	= 7·660
H.I.	8514	„	—		0·500	= 2·760
L.I.	8513	„	—	SPLICED	0·220	= 0·750
H.I.	8514	„	—		0·380	= 2·100
„	„	„	—	SPLICED	0·891	= 4·924
„	„	„	—		1·638	= 9·060
			TOTAL =		7·047 =	30·611

SUMMARY.

	N.M.	TONS.
After Tank	21·922 =	51·080
Fore Tank	7·047 =	30 611
TOTAL =	28·969 =	81·691

Picked-Up Cable in Fore Hold.—Piece "C," No. 8512, Single Core=0·894 N.M.=1·944 tons; and Piece "B," No. 8512, Single Core=0·200 N.M.=0·435 tons.

HOUR.	ON CABLEGROUND AND STEAMING TO PORTLAND.
	FRIDAY, JULY 17th (17th DAY OUT).—*Contd.*
P.M. 7.35	Up to Mark Buoy "T." Lowered and sent away boat to dismantle it.
7.38	Knocked up tumbler, and commenced picking up moorings.
7.40	Hoisted buoy and boat.
7.55	All moorings on board. Set on for Mark Buoy "B."
8.0	Light NE breeze. Fine and clear. Bar. 29·63. Ther. 72° F. Temp. 70° F. dry, 66° F. wet.
8.16	Up to Mark Buoy "B." Lowered and sent boat to dismantle it.
8.20	Knocked up tumbler, and commenced to pick up moorings.
8.25	Hoisted buoy and boat.
8.35	All moorings aboard. Set on to land Pilot O'Neill at Horse Island.
MID.	Light NNE breeze. Fine and clear. Bar. 29·86. Ther. 72° F. Temp. 72° F. dry, 63° F. wet.
	SATURDAY, JULY 18th (18th DAY OUT).
A.M. 4.0	Light NW wind and fine. Bar. 29·65. Ther. 68° F. Temp. 70° F. dry, 61° F. wet.
5.0	Stopped off Horse Island and landed Pilot O'Neill.
5.10	Set on full ahead for Portland.
8.0	Light wind, and fine but cloudy. Smooth sea. Bar. 29·73. Ther. 69° F. Temp. 68° F. dry, 63° F. wet.
10.0	Slowed for fog.
10.30	Fog cleared. Full speed.
NOON.	Light wind. Fine and clear. Position { Lat. 51° 9′·3 N. Lon. 9° 7′·8 W. Bar. 29·80. Ther. 70° F. Temp. 74° F. dry, 64° F. wet.

HOUR.	SATURDAY, JULY 18th (18th DAY OUT).—*Contd.*
P.M.	
4.0	Light WSW breeze. Fine and clear. Smooth sea. Bar. 29·82. Ther. 69° F. Temp. 74° F. dry, 65° F. wet.
5.0	During the afternoon cable hands transferred Pieces "G" and "K" to fore hold and Piece "H" to after tank; also the 2·00 N.M. piece of Int. 02664 was transferred to after tank on top of Piece "H."
MID.	Light WSW wind. Fine and clear. Bar. 29·93. Ther. 71° F. Temp. 70° F. dry, 60° F. wet.
	SUNDAY, JULY 19th (19th DAY OUT).
A.M.	
3.30	"Wolf" abeam.
4.0	Light NW wind. Fine weather. Bar. 29·91. Ther. 68° F. Temp. 71° F. dry, 62° F. wet.
5.43	Signalled number to Lloyd's Station, Lizard Point.
8.0	Similar wind and weather. Bar. 29·98. Ther. 66° F. Temp. 67° F. dry, 63° F. wet.
9.35	Eddystone Lighthouse abeam.
11.25	Start Point Lighthouse abeam.
NOON.	Similar wind and weather. Bar. 29·99. Ther. 72° F. Temp. 72° F. dry, 72° F. wet.
	Position { Lat. 50° 16′ N. Lon. 3° 24′·5 W.
P.M.	
2.38	Observed Portland Bill.
4.0	Light SW breeze. Cloudy and overcast. Bar. 29·90. Ther. 67° F. Temp. 64° F. dry, 57° F. wet.
4.12	Rounded Shambles.
4.55	Entered harbour.
5.25	Alongside coal hulk.
	Draught on arrival { Fore = 10′ 8″ Aft = 12′ 9″
6.0	Messrs. Gott and Crawford, with Capt. Combe, left for shore.

HOUR.	SUNDAY, JULY 19th (19th DAY OUT).—*Contd.*
P.M.	
8.0	Light variable wind. Fine and clear. Bar. 30·00. Ther. 70° F. Temp. 70° F. dry, 62° F. wet.
9.0	Began coaling into bunkers.
11.50	Shore party returned to ship.
MID.	Similar wind and weather. Bar. 30·00. Ther. 70° F. Temp. 70° F. dry, 63° F. wet.

HAVRE—WATERVILLE CABLE
EASTERN REPAIR.

S.S. "BUCCANEER."

HOUR.	MONDAY, JULY 20th (20th DAY OUT).
A.M. 2.45	Finished coaling. Amount shipped = 100 tons.
4.0	Light WNW breeze. Fine and clear. Bar. 30·03. Ther. 64° F. Temp. 70° F. dry, 60° F. wet.
6.0	Cast off moorings from hulk and left for anchorage.
6.15	Let go anchor.
8.0	Similar wind and weather. Bar. 30·05. Ther. 67° F. Temp. 70° F. dry, 60° F. wet.
9.0	Messrs. Gott and Crawford left for shore.
11.50	Messrs. Gott and Crawford returned to ship with visitors.
NOON.	Similar wind and weather. Bar. 30·06. Ther. 70° F. Temp. 72° F. dry, 62° F. wet.
P.M. 2.0	Visitors left ship.
2.25	Hove up anchor and set on for cable ground off Barfleur.
2.35	Passed breakwater.
2.47	Discharged pilot. Full speed ahead.
3.27	Passed Shambles Light Ship.
4.0	Light W breeze. Overcast. Bar. 30·20. Ther. 78° F. Temp. 73° F. dry, 64° F. wet.
5.0	During the day the cable hands transferred from fore to after tank the 1·100 N.M. spliced up piece and the $\left\{\begin{matrix}\cdot 891 \text{ N.M.} \\ 1\cdot 638 \text{ N.M.}\end{matrix}\right.$ spliced piece. In this second piece the splice was cut out and the fault removed. All the short pieces were afterwards spliced up and turned into the after tank.

TABLE SHOWING CABLE IN SHIP ON LEAVING PORTLAND FOR THE REPAIR.

AFTER TANK.

Type.	Factory No.	Core.	Length. N.M.		Weight. Tons.
H.I.	8514	Single	1·623		
„	„	„	0·891		
„	„	„	0·380	= 3·614	= 19·501
L.I.	8513	„	0·220		
H.I.	8514	„	0·500		
Int.	02664	„		2·000	= 7·660
Main	8502	„		1·178	= 2·790
L.D.S.	2147	S.A.		10·696	= 23·700
„	„	„		3·000	= 6·500
Main	8512	Single		1·161	= 2·512
„	„	„		1·635	= 3·556
„	„	„		0·994	= 2·162
L.I.	8553	Twin		1·109	= 3·790
Main	8552	„		3·054	= 8·860
		TOTAL	=	28·441	= 81·031

(Spliced Up)

FORE TANK.

Type.	Factory No.	Core.	Length. N.M.	Weight. Tons.

EMPTY.

Piece "K," No. 8502, Single Core=0·083 N.M.=0·197 tons; and Piece "C," No. 8502, Single Core=0·157 N.M.=0·372 tons.

Picked-Up Cable in Fore Hold.—Piece "C," No. 8512, Single Core=0·894 N.M.=1·944 tons; and Piece "B," No. 8512, Single Core=0·200 N.M.=0·435 tons.

HOUR.	MONDAY, JULY 20th (20th DAY OUT)—*Contd.*
P.M. 8.0	Light W. wind. Fine and clear. Bar. 30·22. Ther. 74° F. Temp. 69° F. dry, 61° F. wet.
11.35	In position to place Mark Buoy. Paid out moorings and slipped buoy. *Buoy's Moorings.*—Buoy No. 47, Flag blue "B," 2 lamps and hanger, $\frac{5}{8}$" bridle, 30 fms. $\frac{3}{4}$ chain, also 30 fms. $\frac{5}{8}$" and $2\frac{1}{2}$ fms. $\frac{3}{4}$" chain, 2 mushrooms 4 cwt. 1 qr. 16 lb. and 3 cwt. 0 qr. 14 lb. Position { Lat. 49° 53′·8 N / Lon. 1° 23′·9 W } 38 fms.
MID.	Similar wind and weather. Bar. 30·22. Ther. 72° F. Temp. 69° F. dry, 60° F. wet.
	TUESDAY, JULY 21st (21st DAY OUT).
A.M. 0.20	Sounded No. 21—38 fms. h. n. sn. Bottom temperature 61·5° F.
0.46	Sounded No. 29—37 fms. h. n. sn. Bottom temperature 58·7° F.
1.5	Set on for position to grapple.
2.20	Lowered centipede with $2\frac{1}{2}$ fms. trail chain and 20 fms. $\frac{5}{8}$" chain, and commenced paying out 4×4 rope.
	DRAG No. 1.
2.25	Ind.=33 revs.=100 fms. of rope paid out. Commenced drag. Engines used as required.
4.0	Light N wind and overcast. Bar. 30·22. Ther. 70° F. Temp. 67° F. dry, 61° F. wet.
4.40	Strain rose (for the first time), to 18 cwt. steadily. Commenced picking up.
4.45	Strain rose to 60 cwt. Paid out a few fms.
4.47	Strain fell. Resumed picking up.
5.0	Grapnel at bows, with cable. Strain, 70—80 cwt. Got drum ropes along and made fast to each side of cable.
5.25	Cut cable.

HOUR.	TUESDAY, JULY 21st (21st DAY OUT)—*Contd.*
A.M. 5.30	Took grapnel inboard and took starboard drum rope to drum (Waterville end), and commenced picking up for testing.
6.1	End to Waterville abaft drum. Commenced testing.
6.26	Finished testing—"O.K." Prepared to buoy end.
6.30	Sealed Waterville end.
6.45	Veered away on Waterville end and picked up on Havre end for testing.
8.0	Similar wind. Fine and clear. Bar. 30·30. Ther. 69° F. Temp. 65° F. dry, 61° F. wet.
10.50	Paid away on Havre end, in order to pick up on Waterville end and buoy same.
11.5	Picked up on Waterville end and attached buoy's moorings.
11.45	Paid out buoy's moorings with Waterville end attached.
11.53	All moorings paid out. Let go buoy. Position { Lat. 49° 52′·9 N. Lon. 1° 21′·9 W. *Buoy's Moorings.*—Buoy No. 55, Flag "S," Lamp hangers, $\frac{5}{8}$″ bridle, 5 fms. $\frac{3}{4}$″ chain, 15 fms. 4×4 rope, 40 fms. $\frac{5}{8}$″ chain, 15 fms. 4×4 rope. Mushrooms 2—3 cwt.
11.55	Commenced picking up to fault in Havre end. End of cable off drum. Set Ind. Zero, coiling cable in after tank.
NOON.	Similar wind and weather. Bar. 30·33. Ther. 73° F. Temp. 73° F. dry, 63° F. wet.
P.M. 0.57	Ind.=423 revs=1·220 N.M. Splice passed inboard=Piece "L." Resumed picking up, cable now coming in, in bad condition.
1.5	Ind.=436 revs.=1·257 N.M. Broken end passed inboard. From the above splice to the end=0·037 N.M. the cable was in very bad condition, and only holding together by the core in places. This piece was thrown overboard.
1.15	Set on to grapple for Havre end again.
1.30	Lowered centipede as in previous drag.

HOUR.	TUESDAY, JULY 21st (21st DAY OUT)—*Contd.*
	DRAG No. 2.
P.M. 1.35	Ind. = 33 revs. = 100 fms. of 4 × 4 rope paid out. Commenced drag. Engines used as required.
1.55	Strain rose to 25 cwt. steadily. Commenced picking up.
2.0	Grapnel at bows with cable. Got drum rope and secured to bight of cable. Took grapnel inboard and took drum rope to drum.
2.30	Hove bight of cable inboard and secured drum ropes to each side of bight, and cut cable.
2.42	Commenced testing to Havre—"O.K."
3.10	Decided to pick up on Havre end for 0·5 N.M. to ascertain condition of cable.
3.35	Condition of cable fair, wires badly corroded. Stopped picking up. Ind. = 65 revs. = 0·187 N.M. Cut cable. Piece "M" ready for splice with top end of Piece "L" in after tank and commenced opening out same. Short piece coiled in fore tank.
3.45	Got up top end of Piece "L" from after tank and opened it out for splice with Havre end.
4.0	Mod. W breeze. Overcast and cloudy. Bar. 30·21. Temp. 79° F. dry, 69° F. wet. Opened out bottom end of Piece "L" and top end of spliced-up section.
5.15	Commenced joint between Havre end and top end Piece "L." *Cut 5 fms. off* Havre end.
6.10	Finished joint.
6.15	Commenced splice.
6.50	Finished splice.
7.20	Commenced joint between bottom end of Piece "L" and top end of spliced-up Section H. I 8514 in after tank. *Cut 5 fms. off* spliced-up section for splice.
7.30	Hove in short Piece "N" towards Waterville = 0·132 N.M.
7.33	Put turns of tank (Havre) end on drum.

HOUR.	TUESDAY, JULY 21st (21st DAY OUT)—*Contd.*
P.M. 7.40	Set on "slow" ahead, paying out Piece "L" from after tank. Splice passed off drum. Ind. set Zero.
8.10	Ind. = 353 revs. = 1·018 N.M. of rope paid out. Stopped ship, put brakes down and took turns of cable off drum.
8.15	Finished joint between Piece "L" and spliced-up section.
8.20	Commenced paying out moorings to moor ship for night. Veered away on cable accordingly.
8.45	Ship's Moorings all paid out. Put stoppers on and took 4×4 rope off drum and took cable to drum again. Put rounding on both to await daylight to resume paying out. *Note.*—No lamps were put on the buoy on Waterville end, which necessitates waiting till daylight.
9.0	Commenced splice between Piece "L" and spliced-up section.
9.50	Finished splice between Piece "L" and spliced-up section.
MID.	Similar wind and weather. Bar. 30·22. Ther. 69° F. Temp. 67° F. dry, 66° F. wet.
	WEDNESDAY, JULY 22nd (22nd DAY OUT).
A.M. 2.5	Picked up 0·288 N.M. of cable, and paid out on grappling rope. Ship swinging to tide.
4.0	Moderate WSW wind. Cloudy. Bar. 30·13. Ther. 69° F. Temp. 72° F. dry, 63° F. wet.
6.50	Picked up ship's moorings.
6.55	Put turns of cable on drum and set Ind. = Zero.
7.0	Commenced paying out cable from after tank to Waterville buoyed end. Put engine out of gear. Engines used as required.
7.20	Ind. = 124 revs. Splice between *Piece "L"* and spliced up section in after tank passed off drum.
7.27	0·50 N.M. paid out from splice. Strain = 18 cwt.
7.37	1·00 ,, ,, ,, ,, 19 ,,
7.45	1·50 ,, ,, ,, ,, 16 ,,

HOUR.	WEDNESDAY, JULY 22nd (22nd DAY OUT)—*Contd.*
A.M. 7.50	Splice H.I. 8514—H.I. 8514 passed off drum. This is the top piece of the spliced up section = 1·623 N.M.
7.55	Approaching Waterville buoyed end. Lowered and sent boat away with drum rope to dismantle it.
8.0	Similar wind and weather. Bar. 30·16. Ther. 73° F. Temp. 74° F. dry, 63° F. wet. Knocked up tumbler and hove in slack of buoy's moorings by winch. Put engine in gear.
8.7	Hove up buoy and boat. Ind. 768 − 124 = 664 revs. = 1·915 N.M. of rope paid out. Took turns off drum.
8.15	Took buoy's moorings to drum and resumed picking up on same.
8.30	Veered away 57 fms. of cable.
8.40	All buoy's moorings on board and Waterville end abaft drum. Commenced testing to Waterville.
10.0	Finished testing to Waterville. Gave out end for joint. Finished testing to Havre. Gave out end for joint.
10.50	Cut Havre end and commenced opening out both ends for joint.
10.55	Commenced joint. Cut 5 fms. off Havre (tank) end.
11.15	Sounded No. 31T—40 fms. Temp. of bottom = 59°·9 F.
11.55	Finished joint.
NOON.	Light WSW wind. Cloudy and overcast. Bar. 30·16. Ther. 73° F. Temp. 74° F. dry, 63° F. wet.
P.M. 0.20	Commenced splice.
1.0	Finished splice.
1.5	Started veering away on hanging ropes.
1.10	Bent slip stopper on to bight of cable and cut hanging ropes.

HOUR.	WEDNESDAY, JULY 22nd (22nd DAY OUT)—*Contd.*
P.M.	
1.17	Slipped final splice. Position {Lat. 49° 52′·9 N / Lon. 1° 21′·9 W} 40 fms Set on to pick up Mark Buoy.
1.30	Up to Mark Buoy. Lowered boat and sent her away to dismantle it.
1.37	Knocked up tumbler and commenced picking up moorings
1.50	Hoisted buoy and boat.
2.7	All buoy's moorings on board. Set on full speed for London.
4.0	Light WSW breeze. Cloudy and overcast. Bar. 30·08. Ther. 72° F. Temp. 74° F. dry, 63° F. wet.
7.50	Observed Beachy Head Lighthouse.
8.0	Light SSW breeze. Cloudy and overcast. Bar. 30·01. Ther. 74° F. Temp. 63° F. dry, 61° F. wet.
11.15	Dungeness Light abeam.
11.40	Stopped and took Pilot and proceeded.
MID.	Light SSW wind. Fine and clear.

Cable Picked Up and Abandoned.

1·220 N.M. Piece "L," picked up to fault after buoying Waterville end ="O.K." Type B 12, No. 6, 130/130.

Fac. No. 8514.

0·037 N.M. Part Piece "L." Bad, and thrown overboard.

0·187 N.M. Piece "M." Picked up to ascertain condition of cable; broke while picking up on Havre end.

0·132 N.M. Piece "N." Short piece picked up to break after Drag 2, Havre end="O.K."

0·005 N.M. Cut off Havre end for splice with Piece "L," which was relaid.

1·581 N.M. Total picked up.

1·369 N.M. Abandoned length, as agreed with Mr. Gott.

2·950 N.M.=Total.

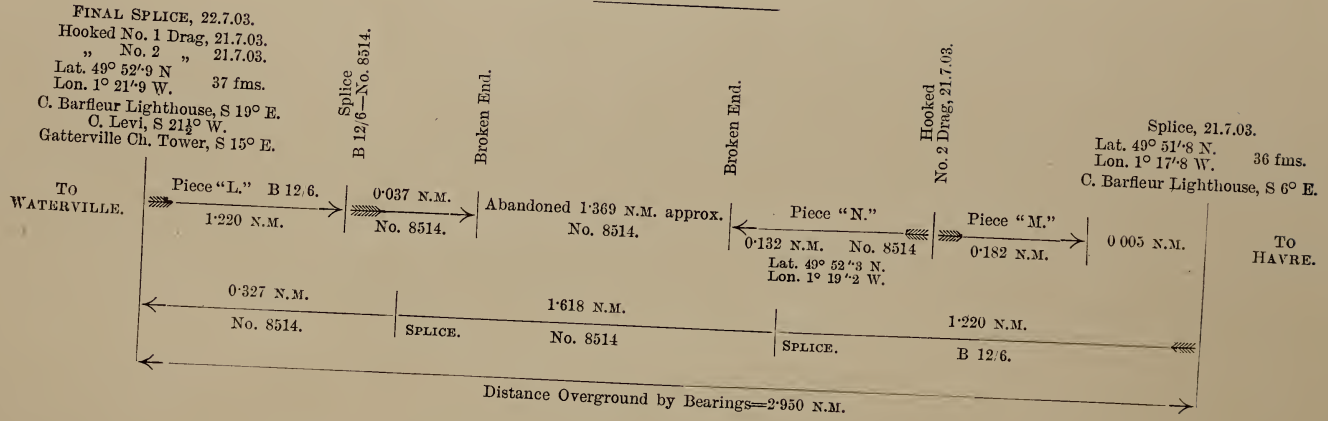
Cable Relaid and Expended.

1·220 N.M.	Type B.	Piece "L" relaid.
1·618 N.M.		H.I. No. 8514, top piece.
0·005 N.M.		Splice Piece "L" and H.I. No. 8514, cut off latter.
0·270 N.M.		Paid out by Ind. H.I. No. 8514.
0·057 N.M.		" " "
0·005 N.M.		Final splice cut off tank end.
3·175 N.M.		
1·220 N.M.		Piece "L" picked up and relaid.

1·955 N.M.=Total new cable expended.

HAVRE—WATERVILLE EASTERN REPAIR, JULY 21st—22nd, 1903.

S.S. "BUCCANEER."



CABLE PICKED UP.

B 2/6	=	1·220 N.M.
No. 8514	=	0·361 "
TOTAL	=	1·581 N.M.

CABLE LAID.

Picked-Up Cable, B 12/6	=	1·220 N.M.
Ship's (C. C. Co.'s) No. 8514 ..	=	1·945 "
TOTAL	=	3·165 N.M.

HOUR.	STEAMING TO LONDON.
	THURSDAY, JULY 23rd (23rd DAY OUT).
A.M. 1.30	Off South Foreland.
2.15	Gull Lightship abeam.
3.50	Tongue Lightship abeam
4.0	Light WSW breeze, and clear. Bar. 29·92. Ther. 69° F. Temp. 72° F. dry, 64°. F wet.
6.40	Chapman Lightship abeam.
7.40	Off Gravesend. Pilot Anderson left ship, Pilot Twist boarded.
8.0	Similar wind and weather. Bar. 29·91. Ther. 69° F. Temp. 72° F. dry, 64° F. wet.
9.0	Off Silvertown and moored inshore of "Dacia."
	FRIDAY, JULY 24th.
NOON.	Paid all crew off at Tidal Basin Shipping Office.

DISTRIBUTION OF CABLE AND WEIGHT IN SHIP ON ARRIVAL OFF WORKS.

AFTER TANK.

Type.	Factory No.	Length. N.M.		Weight. Tons.
H.I.	8514	0·559	SPLICED UP.	
„	„	0·380		9·17
L.I.	8513	0·220		
H.I.	8514	0·500		
Int.	02664	2·000		7·66
Piece "H"	8502	1·178		2·79
L.D.S.	2147	10·969		23·70
„	„	3·000		6·40
Main	8512	1·161		2·52
„	„	1·636		3·55
„	„	0·994		2·16
L.I.	8553	1·109		3·79
Main	8552	3·054		8·86
		26·760		70·70

FORE TANK.

Type.	Factory No.	Length. N.M.	Weight. Tons.
Piece "N"	8514	0·132	0·73
„ "M"	„	0·187	1·03
		0·319	1·76

FORE HOLD.

Type.	Factory No.	Length. N.M.	Weight. Tons.
Piece "K"	8502	0·083	0·197
„ "G"	„	0·157	0·372
„ "C"	8512	0·894	1·945
„ "B"	8512	0·200	0·435
		1·334	2·949

SUMMARY.

	N.M.		TONS.
After Tank	26·760	=	70·70
Fore Tank	0·319	=	1·76
Fore Hold	1·334	=	2·95
	28·413	=	75·41

HAVRE—WATERVILLE CABLE REPAIRS.

S.S. "BUCCANEER."

ELECTRICAL REPORTS.

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ELECTRICAL REPORT.

(WESTERN REPAIR, JULY 1ST—6TH, 1903.)

ELECTRICAL REPORT.

(WESTERN REPAIR, JULY 1ST—6TH, 1903.)

F. C. CRAWFORD, ESQ.,
Engineer in Charge.
S.S. "Buccaneer."

DEAR SIR,

Two partial earth faults having developed in the above section, the "Buccaneer" was chartered by the Commercial Cable Company to remove the same, and left the Silvertown Works at 8 p.m., July 1st (Mr. J. Gott having previously joined ship), and proceeded to position of Western fault, which had been localised at 60 miles approximate West of Scilly Isles. On July 3rd, 5.30 p.m., arrived on cable ground, streamed Mark Buoy, and took a series of soundings (see Appendix), and then started dragging for cable, which was hooked at second drag, but parted at bows. Grappling was resumed, and at the seventh drag the cable was caught. At 5.32 p.m. (July 4th), Waterville end was handed to testing room, but on testing it was found to be a "short end." Havre end was now dealt with, the ship being in communication with that station from 6.22 p.m. A preliminary test taken with 5 cells gave a total D.R. of $\overset{\omega}{7365}$ falling. From 6.50 to 9 p.m., a series of tests were taken from ship and Havre to locate position of Eastern fault, but owing to its very variable resistance, polarization changes being frequent and rapid, the results obtained were only very approximate, and therefore misleading. At 9.5 p.m. the lowest resistance (zinc 20 cells), obtained by H.R. being $\overset{\omega}{6400}$ (end earthed on board). Lowest resistance at any time obtained by H.R. $= \overset{\omega}{5600}$. Carbon to line from ship $= \overset{\omega}{20000}$. (End earthed in all cases mentioned.)

Ships results by Blavier's formula and Anderson and Kennelly's earth overlap varied to an extraordinary degree, *i.e.* from 2320 ω to 4703 ω.

At 9.8 p.m. sent S. G.—Gott to V. P., G. M. and M. E., "Saturday cable broke on picking up. 6 a.m., spoke H. R. 6.20 : Fault on Havre side cannot be localised at present; now buoy and go for Waterville end; weather getting squally and unpromising."

9.11 p.m. Gott to S. H. R., "We seal your end and buoy. Try and seal the fault with carbon 20 or 30 cells and get a capacity; wire results to Waterville."

Havre end was buoyed at 9.45 p.m., and loose piece of cable towards Waterville picked up. Length recovered = 0·708 N.M., Piece "A," type No. 8512. Cruised round cable and Mark Buoys all night.

The following morning, July 5th, was unfavourable for cable work, so the opportunity was taken of splicing up Piece "A" to Piece 5 in the Fore tank, which, tested after splicing, gave a D.R. per N.M. = 617· Ω at 59½° F. (200 volts). Weather becoming finer, the grapnel was lowered again—Drag 8—and at 2.40 p.m. cable was at bows, the end being handed to testing room at 3.22 p.m. Waterville was called and replied immediately, signals being very jerky and failing. Waterville was instructed to "free," and ship tested, and with 1 Léclanche cell obtained a total D.R. of 73 ω. H. E. C.'s triple test was then taken and the fault on Waterville side located at 16 ω = 0·969 N.M. approximate from ship. At 4 p.m. started picking up on Waterville end to fault and loose end at same time, the latter coming on board at 4.30 p.m. Length p.u. = 0·200 N.M., Piece "B." During the process of picking up on Waterville end a control was kept on cable by means of observing the natural current from fault—230 S.R. 200—and at 4.52 p.m. a great change was observed, the deflection falling to 100, until at 5.5 p.m., bad kink passed over drum, deflection fell to zero and then rose slowly to 80. Fault inboard. The cable was cut at kink which was found to be the fault.

Nature of fault :—Kink, damage caused by trawler. When the

kink was opened out the conductor was found to be exposed in two places.

Length picked up on Waterville end to fault = 0·894 N.M., Piece "C."

After cutting out the kink, Waterville end was tested from ship, results showing that the fault had been removed from cable.

D.R. (20 cells), 1st min. Z. total = 31·111 Ω = 5510· Ω per N.M. at sea temp. (See Appendix.)

Conductor resistance mean Z. and C. total corrected = 2907·5 Ω.

Length in circuit = 177·13 N.M.

At 5.40 p.m. the following S. G.'s were received on board. To Gott, "Fourth fault of 20000 ohms. resistance appeared in Northern yesterday, our tests useless. Canso makes 614 added to loop = 100 ohms. from here."

S. W. V. to Gott.—"Canso's test to-day loop 14370 added to Northern 614."

5.50 p.m. V. P. to Gott.—"Can 'Buccaneer' proceed after repairing H.R. to take out fault in Northern. Have you cable on board?"

S. W. R. to Gott.—"After being on for ten hours carbon makes resistance go up only to 30000 ohms. No Capacity test possible."

5.53—6 p.m. Waterville took C.R. from Waterville to ship. Total, 2908 ω. Ship then took capacity test (Null Method), obtaining a total capacity in circuit between ship and shore = 54·150 mfds. (See Appendix.)

NOTE.—By comparison with the 75° values this capacity represents a length in circuit of 176·517 N.M. from Waterville C.H. to ship, from which must be deducted 0·221 N.M. = Waterville land line. Therefore 176·517—0·221 = 176·296 N.M. to Waterville from ship.

At 7.10 p.m. the joint was commenced between cable in after tank and Waterville end, and at 9.45 the splice was completed. From 8.15 to 8.41 several S.G.'s were sent to Waterville, the following—bearing on the Northern repair—being the most important.

Gott to V. P.—"Sunday, 8.0 p.m. Taken out fault, spliced on and will soon pay out to Havre end. Another fault between ship and Havre partial continuity. If they can work, propose go Waterville. 'Buccaneer' has sixteen miles suitable cable for Northern on board. Fault in Northern appears to be about fifty miles from Waterville. Must locate fault in Havre from shore, and may do so at Waterville. Please reply. If I hear nothing further shall proceed direct to Waterville and wire from there."

At 8.42 p.m. Waterville reported: "Working very well on Northern simplex."

At 9.35 p.m. took temperature sounding at position of "Buccaneer's" Western splice.

Lat. 49° 48′·0 N
Lon. 8° 2′·0 W } Depth 54 fms. Bot. temp. 50° F.

At 10.10 p.m. started paying out cable towards Waterville, a control test with 20 cells being maintained, and at 11.10 Havre cable buoy was reached. At 0.15 a.m., July 6th, received S.G.—S. H. R. to Gott. 10.30 p.m.—"Lowest now, 1320 zinc."

Havre end was on board at 0.20 a.m., and from 0.53 to 1.10 ship tested Havre end—"earthed" and "free" alternately.

Cable free at Havre (20 cells) 5990 $\overset{\omega}{,}$, 6190 $\overset{\omega}{,}$, to false zero. Zinc.

„ earthed „ „ 5040 $\overset{\omega}{,}$, 5150 $\overset{\omega}{,}$ „ „

L taken as 5560 $\overset{\omega}{.}$

By Blavier's formula, 1st pair, $\overset{\text{free}}{5990}$, $\overset{\text{earth}}{5040}$ $x = 4337$ $\overset{\omega}{,}$ from ship to fault.

„ „ 2nd „ 6190, 5150 $x = 4497$ $\overset{\omega}{,}$ „ „

Resistance of line when perfect, Havre to Waterville = 8455 $\overset{\omega}{.}$

Resistance of cable (by ship) from ship to W.V = $\overset{\omega}{2939}$

Resistance of cable (by ship) from ship to fault = $\frac{\overset{\omega}{4337}}{\overset{\omega}{7276}}$

2nd pair, 2939 + 4497 = $\overset{\omega}{7436}$

$\overset{\omega}{8455} - \overset{\omega}{7276} = \overset{\omega}{1179} - \overset{\omega}{110}$ L.L. and E.
$= \overset{\omega}{1069}$ dist. to fault from Bléville.

$\overset{\omega}{8455} - \overset{\omega}{7436} = \overset{\omega}{1019} - \overset{\omega}{110}$ L.L. and E.
$= \overset{\omega}{909}$ dist. to fault from Bléville.

Mean of the two = $\overset{\omega}{989}$ from Bléville to fault.

NOTE.—Result approximate only, the battery not being adjusted so as to give the same C.S. through fault when testing cable either "free" or "earthed."

From 1.15 to 1.25 a.m., Waterville and Havre ends were put through on board in order to exchange signals with each other. At conclusion of time both Havre and Waterville reported signals very good, and at 1.33—1.36 sent S.G.:

Crawford to Silvergray.—"About to make final splice 60 miles west of Scillys, then proceed to Waterville to repair Northern cable. All well. 1.30 a.m., Monday."

Gott to S. W. V.—"We are going to make Final Splice. Get earth overlap test with Havre. Do not apply copper to line. I shall be at Waterville Tuesday morning. Let Canso repeat loop test and give resistance of fault in Northern at time loop taken."

Cable was now cut at tank end. Total cable expended = 2·171 N.M. Ship tested (2.5—2.20 a.m.) Waterville end before making final splice, obtaining highly satisfactory results, viz:

Total C.R. corrected (mean Z. and C.) = $\overset{\omega}{2939}$·4.
Total D.R. 1′ zinc = $\overset{\Omega}{28}$·00 = $\overset{\Omega}{5020}$ per N.M. at sea temp.
Length in circuit = 179·289 N.M.

} See Appendix.

At 2.25 a.m., gave out Waterville end after instructing him to call Havre at 4.0 o'clock.

At 2.40 a.m., gave out Havre end after instructing him to call Waterville at 4.0 o'clock.

July 6th, at 4.10 a.m. the joint was finished, and at 5.15 the splice completed, the Final Splice being slipped at 5.25 a.m.

Position of Final Splice. } Lat. 49° 47′·4 N
Lon. 7° 59′·2 W
Depth 68 fms.

After waiting for the sea to moderate, the mark buoy and moorings were got on board at 10.15 a.m., and at 10.35 ship set on full speed for Waterville, Co. Kerry, Ireland, to repair Commercial Cable Co.'s Northern section. This repair will be the subject of a separate report, and we will now deal with the Eastern repair to the Havre—Waterville Cable.

ELECTRICAL REPORT.

(EASTERN REPAIR, JULY 18TH—23RD, 1903.)

ELECTRICAL REPORT.

(EASTERN REPAIR, JULY 18TH—23RD, 1903.)

NOTE.—The S.S. "Buccaneer" arrived off Waterville on the morning of the 7th July, and at 8.45 a.m. Messrs. Gott and Cann went ashore to Cable Station to localise the faults in the Havre—Waterville and Waterville—Canso Cables.

From a number of tests taken on the Havre—Waterville Sec. by Anderson & Kennelly's Earth overlap—free overlap—etc., a selection was made from those which most closely checked each other, and which placed the fault at from 990 ω to 993 ω from Bléville.

Assuming the mean bot. temp. to be 65° F.,
then this resistance = ... 61·9 from Bléville app.
Assuming the mean bot. temp. to be 63° F.,
then this resistance = ... 62·78 ,, ,, ,,

Mean 62·34 ,, ,, ,,

The S.S. "Buccaneer" having finished the Repair to the Canso—Waterville Northern (1884) Cable at 8.35 p.m., July 17th, discharged her Pilot (O'Neill) off Horse Island, Ballinskelligs Bay, the following morning—18th—at 5 a.m., and proceeded for Portland, there to take in coal and provisions. During the passage and subsequently opportunity was taken to transfer Pieces "G" and "K" (p.u. Canso—Waterville repair) from Fore tank to Hold, and Piece "H" (Canso—Waterville) to After tank, Intermediate Sec. 4, (L = 2000) was also transferred from Fore to After tank. The fault in the 2·5396 N.M. piece of H.I. No. 8514 was also broken down by the application of 560 volts for many hours, a loop test taken and the fault located in the splice 0·9011—1·6385. This cable was transferred

from Fore to After tank and the splice between above pieces cut out, the fault proving to be a defective joint. The separate lengths of H.I. No. 8514 (brought away in "Buccaneer") were now spliced up, making a total length of 3·615 N.M. of No. 8514, the type required for Eastern repair. This section was tested after splicing, and gave highly satisfactory results, viz., D.R. with 200 volts = 1434 Ω per N.M. at 61½° F.

The "Buccaneer" arrived at Portland at 4.55 p.m., July 19th, and after coaling and taking in fresh provisions, left again for cable ground off Cape Barfleur at 2.25 p.m., July 20th, arriving off that place late on the same night, and at 11.55 p.m. streamed Mark Buoy, "BB," took two soundings, 28^{T}, 28 fms., bot. temp. 61½° F., and 29^{T}, 37 fms., bot. temp. 58°·7 F.; at 2.25 a.m., July 21st, lowered grapnel for Drag 1, hooked cable and had it at bows at 5 a m. Called Waterville and got him immediately, and at 5.32 ship tested *Waterville end* with the following result—

Length in circuit = 449·2 N.M.

D.R. 20 cells 1′ Zinc total = 15·8 Ω = 7297 Ω per N.M. at sea temp.

C.R. ,, Mean total Z. & C. (corrected) = 7363 ω.

Waterville obtaining a C.R. to ship = 7370 ω.

At 6.26 a.m. gave out Waterville end for buoying, and had end sealed for testing. Picking up was then commenced on Havre end, which was handed to testing-room at 7.7 a.m. Havre was called and answered immediately, and ship taking a D.R. test with 5 cells, obtained a resistance of 2709 ω only. Havre shortly afterwards getting a C.R. = 1115 ω, end being to earth on board. From 7.40 to 10 a.m. ship and shore testing for locating fault. Very varying results were obtained, the fault being most unsteady. The following were the only workable results obtained from all the series, viz.:

1st measurement—By Blavier's formula = 270 ω from ship.

2nd. ,, Earth overlap (Anderson & Kennelly's) = 7 to 8 ω from ship.

July 21st, 3rd measurement. Earth overlap (Anderson and Kennelly's) = 42·5 ω from ship.

4th measurement. Earth overlap (Anderson and Kennelly's) = 8 ω very unsteady, approximate only.

At 9.19 a.m., Havre obtained a resistance = 1117 ω—"good result." End earthed on board, ship earthing direct, and at 10.0 a.m. shore attempted Kennelly series, "end free on board," but reported, "No reliable Kennelly could be taken, readings varying by 1000 ohms. in same second."

Shortly after the following S.G. was received from Waterville *via* Havre to ship:—"Tests to buoyed end 10th minute, zinc 6570, carbon 6500 megs. per N.M. Capacity = 142·6 mfds."

10.25 to 10.27, sent two S.G.'s—Gott to S. H. R. and V. P. M. E.

Veered away on Havre end at 10.45 a.m. Ready to buoy Waterville end, which was let go at 11.45, and ship then started picking up towards fault on Havre side, Havre at this time taking C.R. end to earth on board and getting a resistance = 1117 ω. Ship now instructed Havre *re* details of fall of potential test which it was decided to take, and at 0.56 p.m. commenced test, when cable parted close to ship. A minute later splice passed off drum between Type B "Mirror" and Type No. 8514 original. Length picked up = 1·223 N.M. Piece "L." This splice was cut out and 37 fms. of very badly damaged and corroded cable, which came in subsequently, were cut off and thrown overboard. The broken end came in at 1.5 p.m. In three places the core only was holding and all sheathing wires were very badly corroded.

Down grapnel again at 1.35 p.m., the cable being hooked and handed to testing room at 2.41, when Havre was called and answered immediately.

Ship took D.R. test on Havre side after removal of fault.

Length in circuit = 59·197 N.M.

20 cells 1′ Zinc total = $\overset{\Omega}{24{\cdot}5}$ = $\overset{\Omega}{1451}$ per N.M. at sea temperature.

NOTE.—This value, although low, is no lower than that obtained from about the same position during recent repairs by "Mirror," "Buccaneer," etc.

Resumed picking up on Havre side to ascertain if cable was in good mechanical condition, it being the intention to examine the cable for about ½-mile, and if found to be in good condition to relay the same.

Tested Piece "L" (L = 1·220 N.M.), Type B, picked up this morning.

D.R. with 200 volts 1′ Z. total = $\overset{\Omega}{3700}$ approx. "O.K."

At 3.35 p.m., stopped picking up and cut cable when 0·187 N.M. had been recovered (Piece "M"). This piece is mechanically bad, the sheathing wires being much worn by abrasion and corrosion.

A C.R. test taken from ship after cutting gave (end to earth at Havre) mean Z. and C. total (corrected) = $\overset{\omega}{1071}$. Length in circuit = 59·015 N.M.

The following S.G was. sent *viâ* Havre at 4.15 p.m.: "Gott to V.P. and M.E., 4.0 p.m. Have cut out fault in Havre. There are three splices to make. Hope to get through to-night. Weather fine." And then gave out Havre cable for splicing on to Piece "L," Type B, (L = 1.220 N.M.) coiled in after tank. Joint finished about 6.0 p.m., the splice also at 7.0 p.m.

Position of "Buccaneer's" First Splice. July 21st, 1903.

Lat. 49° 51′·8 N
Lon. 1° 17′·8 W } 36 fms.

Cape Barfleur Lighthouse S. 6° E.

5.50—6 p.m. Ship tested Havre side for D.R. and I.C. (end free at Havre).

D.R. 1′ Z. total = $\overset{\Omega}{21{\cdot}55}$ = $\overset{\Omega}{1298}$ per N.M. at sea temperature.

Capacity total (Null method) = 20·03 mfds. (See Appendix.)

The loose end towards Waterville was now picked up, break coming inboard at 7.30 p.m., sheathing wires worn to needle points and end perfectly sealed by the G.P. being drawn down over conductor. Length picked up = 0·132 N.M., Piece "N." At 7.40 p.m. commenced paying out cable towards Waterville buoy and stopped paying out when eight turns of Piece "L" remained in tank, and anchored ship for the night with mushroom and buoy-rope. After this operation the splice between bottom end of Piece "L" and top end of H.I. (L = 3·610 N.M.) was completed and work suspended for the night.

Two separate C.R. measurements taken from ship at 10.15 and 10.39 p.m. gave $1140 \cdot 3^{\omega}$, and the D.R. total = $16 \cdot 333^{\Omega} = 1043^{\Omega}$ per N.M.

The following morning, July 22nd, Havre was called up at 6.45 a.m., and ship testing obtained the following results on cable—

D.R. total 1st min. Zinc = $22 \cdot 0^{\Omega} = 1405^{\Omega}$ per N.M. at sea temp.

Havre also took a check D.R. test, getting a total of $22 \cdot 5^{\Omega}$ mean of 4 mins. zinc and 4 mins. copper.

At 6.58 a.m. started paying out cable towards Waterville buoy, which was reached at 7.55. At 9.5 Waterville end was in testing room and ship called, receiving immediate reply.

Ship tested for C.R. and D.R. before making Final Splice.

Conductor Resistance total mean Z. and C. = 7377^{ω}

Dielectric ,, 1′ Zinc total = $17 \cdot 133^{\Omega} = 7696^{\Omega}$ per N.M. at sea temp.

Length in circuit = 449·2 N.M.

The following S.G.'s were sent and received during 9.41—9.52 a.m.

S. W. V. to Gott.—"C. R. loop 14275 added 324. Insulation Northern, tenth min. Zinc and Carbon = 37320 megs. per N.M."

Gott to V. P. and M. E.—"Wednesday, 10 a.m., about to make Final Splice, weather fine, fault due to corrosion. 'Buccaneer' proceeds to London, should arrive Thursday morning."

Gott to S. W. V.—"Please wire tests Havre, care Twist, Trinity Pilot, Gravesend."

Crawford to "Silvergray," *re* final splice and ship's movements.—"At 10 a.m. ship instructed Havre to take C.R., who obtained a total C.R. to ship 7370· ohms."

Waterville was notified (10.13 a.m.), "About to make Final Splice, call Havre at noon," and dismissed, and the tank end of cable was cut. Total paid out between Havre end and Waterville = 3·1655 N.M.

At 10.30 a.m. Havre was informed, "We now make Final Splice, call Waterville at noon," and also dismissed.

The joint between Waterville and Havre ends was finished at noon, and at 1 p.m. the splice was completed and slipped at 1.15 p.m., thus completing the repair.

Position of "Buccaneer's Final Splice." July 22nd, 1903.

Lat. 49 52′·9 N } 40 fms.
Lon. 1 21′·9 W } Bottom temperature = 59°·9 F.

Cape Barfleur Lighthouse, S. 19° E. Cape Levi, S. 21½° W.

Gatterville Church Tower, S. 15° E. Distance overground = 2·95 N.M.

July 22nd. After picking up Mark Buoy, the "Buccaneer" proceeded for London, arriving off Gravesend at 7.40 a.m. the following morning, July 23rd, where Mr. Gott received following telegram from the superintendent at Waterville, "Havre tests Z. 4602, C. 4985 megs. per knot tenth min. C.R. $\overset{\omega}{8}$483—Wilmot."

The "Buccaneer" proceeded up river and made fast off Silvertown Works, inside "Dacia," the same morning.

In the Appendix will be found the following tables, etc.

Revised length and 75° F. values after Western and Eastern repairs, Havre—Waterville cable.

Tests from ship towards Havre and Waterville on picking up ends.
,, ,, ,, ,, before making Final Splice.

Distribution of cable in tanks and 75° values of same before repairs
,, ,, ,, ,, ,, ,, after ,

Expenditure tables of new and picked up cable.

Diagram of operations, etc., Western and Eastern repairs, etc

I am, Dear Sir,

Yours faithfully,

HERBERT E. CANN.
Electrician.

DISTRIBUTION OF CABLE IN TANKS ON BOARD S.S. "BUCCANEER" ON LEAVING THE SILVERTOWN WORKS, JULY 1ST, 1903.

AFTER TANK.

Type.	Factory No.	Core.	Piece.	Length. N.M.
Main	8512	—	5	2·690
„	„	—	6	1·636
„	„	—	4	0·994
L.I.	8553	Twin	—	1·109
Main	8552	„	—	3·054
L.D.S.	2147A	—	10 pt. "B" pt. 3	3·673
„	2147	—	„	10·978
„	„	—	„	3·000

FORE TANK.

Type.	Factory No.	Length. N.M.
Int.	02634	2·000
H.I.	8514	0·500
L.I.	8513	0·2200
H.I.	8514	0·3804
H.I.	8514	0·9011
H.I.	8514	1·6385

Factory Electrical Values at 75° F. of Cable on Board S.S. "Buccaneer," July 1st, 1903.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total	Per N.M.	Total	Per N.M.	Total	Per N.M.	
Int. Sec. 4 02664		2·0000		18·456	FORE 9·228	TANK. 0·7186	·3593	247	494	Top.
H.I. 8514		0·5000		8·515	17·03	0·1780	0·356	764	382	
L.I. 8513		0·2200		3·747	„	0·0783	„	1736·4	„	
H.I. 8514		0·3804		6·478	„	0·1354	„	1004·2	„	
H.I. 8514		0·9011		15·346	„	0 3208	„	423·9	„	
H.I. 8514		1·6385		27·904	„	0·5833	„	233·14	„	Bottom.
		3·6400		61·990	17·03	1·2958	0·356	104·9	382	
Single 8512	Top	2·066		36·054	AFTER 17·451	TANK. 0·6311	·3054			Top.
	Bot.	0·624		10·620	17·02	0·2072	·3320			Piece 5.
		2·690		46·674	17·35	0·8383	·3116			
„	Top	0·304		5·305	17·451	0·0929	·3054			
	Bot.	1·332		23·245	„	0·4068	„			Piece 6.
		1·636		28·550	17·451	0·4997	·3054			
„		0·994		16·91	17·02	0·3300	·3320	583	580	Piece 4.
Twin Core 8553	No. 1	1·1085	1·1210	14·720	13·13	0·3704	·3304	2132	2390	
	No. 2			14·730	13·14	0·3689	·3291	2618	2935	
Piece 3 8552	Plain 1	0·053	0·054	0·718	13·29	0·0162	·2993			
	Rib 2			0·716	13·26	0·0159	·2950			"Buccaneer," 30.7.02.
Piece 2 8552	Plain 1	0·243	0·2457	3·265	13·29	0·0735	·2993			
	Rib 2			3·258	13·26	0·0725	·2950			"Buccaneer," 30.7.02.
Piece 1 8552	Plain 1	2·708	2·738	36·389	13·29	0·8196	·2993			
	Rib 2			36·305	13·26	0·8078	·2950			"Buccaneer," 30.7.02.
Piece 4 8552	Plain 1	0·050	0·0506	0·6645	13·29	0·0151	·2993			
	Rib 2			0·6710	13·26	0·0149	·2950			
The above pieces of Type No. 8552 as spliced up.										
Twin Core 8552 D.S.	Plain 1	3·054	3·089	41·037	13·29	0·9244	·2993			
	Rib 2			40·950	13·26	0·9111	·2950			
10 pt. B pt. 3 2147A D.S.		3·673		19·570	5·328	1·3267	·3612	226·25	831	
10 pt. B 2147 D.S.		10·978		58·458	5·325	3·9268	·3577	67·86	745	
10 pt. B 2147		3·000		15·987	5·329	1·0996	·3665	277·7	833	

HAVRE—WATERVILLE (1884) CABLE.

WESTERN REPAIR, JULY 6TH, 1903.

EXPENDITURE TABLE.

Cable recovered during Repair, Type No. 8512.

	N.M.
Relaid in Section, part Piece "A" ... ... =	0·636
Cut off Piece "A"—screwy ... ... =	0·066
„ „ „ „ damaged ... ... =	0·020
Splice to Waterville end ... ... =	0·006
Original length, Piece "A" ... ... =	0·728
Cut off damaged, Piece "C" ... ... =	0·010
„ „ Havre end for Final Splice ... ... =	0·006
Piece "B," coiled in Fore Tank ... ... =	0·200
„ "C," „ „ „ „ ... ... =	0·894
Total ... ... =	1·838

Piece 5, Tpye No. 8512, in After Tank.

	N.M.
Original length ... ... =	2·690
Laid in Havre—Waterville Section, 6.7.03 ... ... =	1·529
Remaining in After Tank ... ... =	1·161

Laid in Section as above.

	N.M.		
Part Piece "A" ... =	0·636	{ Waterville splice	} Type No. 8512.
„ „ 5 ... ... =	1·529	{ Havre „	
Total... ... =	2·165		

HAVRE—WATERVILLE (1884) CABLE.

WESTERN REPAIR, JULY 6TH, 1903.

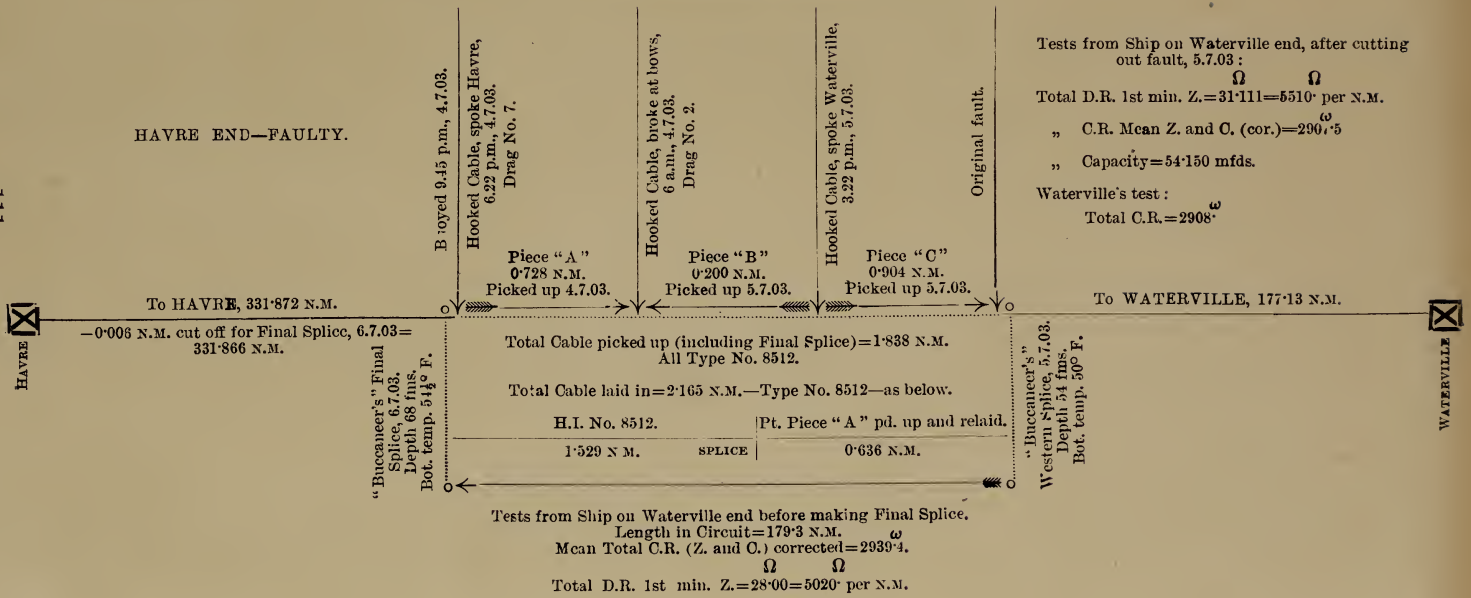
Amount of Cable cut out of Section.

	N.M.
July 4th.—Cut off Havre end—damaged	= 0·020
Picked up towards Waterville, 4.7.03, Piece "A"	= 0·708
„ 5th.—Cut off Waterville end—damaged	= 0·010
Picked up loose end towards Havre, Piece "B"	= 0·200
„ „ Waterville end, Piece "C"	= 0·894
„ 6th.—Cut off Havre end for Final Splice	= 0·006
Total cut off	= 1·838

Cable laid in Waterville and Havre Buoys.

	N.M.
Piece "A," picked up 4.7.03, 0·642—0·006 ...	= 0·636
Part Piece 5	= 1·529
Total laid in Section	= 2·165
Splice cut off tank end (to Waterville Cable) ...	= 0·006
Total expended	= 2·171

DIAGRAM SHOWING CABLE OPERATIONS DURING WESTERN REPAIR BY S.S. "BUCCANEER." JULY 4TH TO 6TH, 1903.



Tests from Ship on Waterville end, after cutting out fault, 5.7.03:

Ω Ω

Total D.R. 1st min. Z.=31·111=5510· per N.M.

ω

„ C.R. Mean Z. and C. (cor.)=2907·5

„ Capacity=54·150 mfds.

Waterville's test:

ω

Total C.R.=2908·

Tests from Ship on Waterville end before making Final Splice.

Length in Circuit=179·3 N.M.

ω

Mean Total C.R. (Z. and C.) corrected=2939·4.

Ω Ω

Total D.R. 1st min. Z.=28·00=5020· per N.M.

HAVRE—WATERVILLE CABLE.

DISTRIBUTION OF CABLE IN TANKS, ETC., ON BOARD S.S. "BUCCANEER" ON LEAVING PORTLAND, JULY 20TH, 1903, FOR EASTERN REPAIR.

AFTER TANK.

Type.	Factory No.	Core.		Length. N.M.
H.I.	8514	Single	$^{70}/_{75}$	= 1·6235
„	„	„	„	= 0·8911
„	„	„	„	= 0·3804
L.I.	8513	„	„	= 0·220
H.I.	8514	„	„	= 0·500
Int.	02664	„	$^{130}/_{130}$	= 2·000
Main Piece "H"	8502	„	$^{450}/_{270}$	= 1·178
L.D.S.	2147	„	$^{255}/_{225}$	= 10·696
„	„	„	„	= 3·000
Main	8512	„	$^{70}/_{75}$	= 1·161
„	„	„	„	= 1·635
„	„	„	„	= 0·994
L.I.	8553	Twin	$^{90}/_{85}$	= 1·1085
Piece 3	8552	„	„	= 0·053
„ 2	„	„	„	= 0·243
„ 1	„	„	„	= 2·708
„ 4	„	„	„	= 0·050

FORE TANK.

EMPTY.

FORE HOLD.

Type.	Factory No.		Length. N.M.
Piece "K"	8502	$^{450}/_{270}$	= 0·083
„ "G"	„	„	= 0·157
„ "C"	8512	$^{70}/_{75}$	= 0·894
„ "B"	„	„	= 0·200

HAVRE—WATERVILLE (1884) CABLE.

EASTERN REPAIR, JULY, 1903.

Cable picked up and cut out of Section.

		N.M.
Picked up	Piece "L." Type B. Relaid ... . =	1·220
	„ "M." „ No. 8514. On board "Buccaneer" =	0·187
	„ "N." „ „ „ „ „ =	0·132
		1·539
Cut off, bad—thrown overboard ... ... =		0·037
5 fms. cut off Havre end for Splice ... ... =		0·005
Abandoned ... ... =		1·369
Total cut out ... ... =		2·950

Laid in Section.

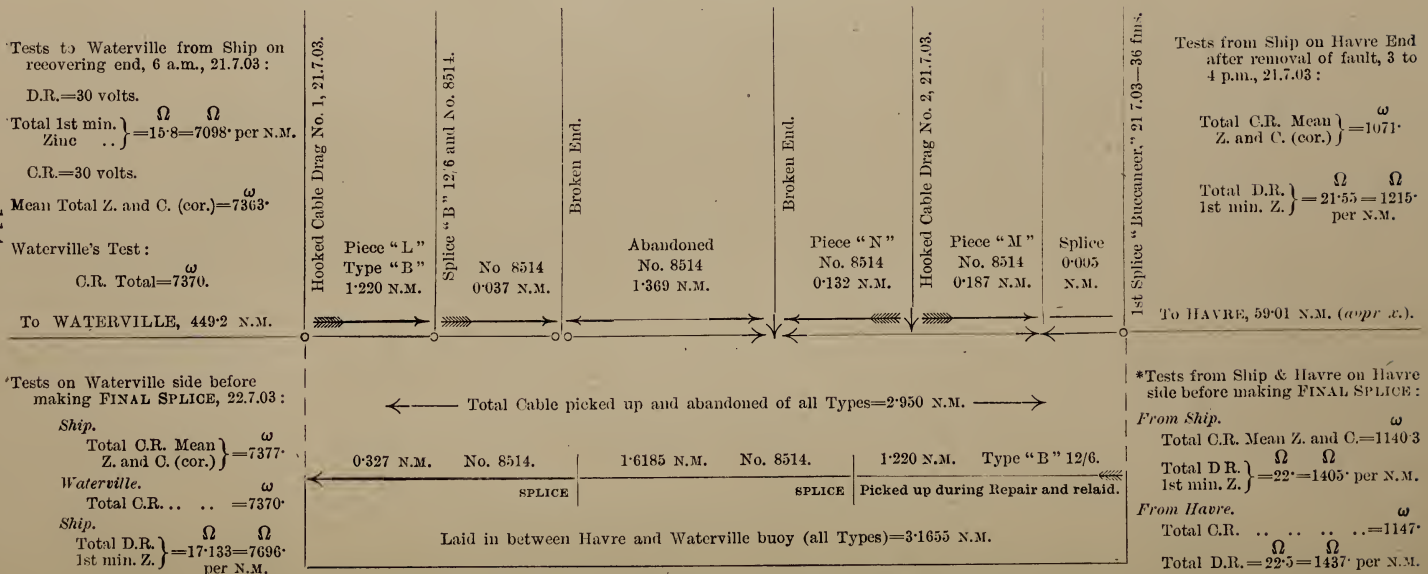
	N.M.
Piece "L." Picked up and relaid ... ... =	1·2200
H.I. No. 8514 ... ... =	1·6185
„ „ ... ... =	0·3270
Total ... ... =	3·1655

Total Cable Expended.

	N.M.
H.I. No. 8514. 1·6185 N.M. + 0·005 N.M. for Splice ... =	1·6235
„ „ 0·3270 „ + 0·005 „ „ „ ... =	0·3320
Piece "L" ... ... =	1·2200
Total ... ... =	3·1755
Deducting Piece "L," picked up and relaid ... ... =	1·2200
Tank Cable Expended ... ... =	1·9555

HAVRE—WATERVILLE CABLE.

DIAGRAM SHOWING CABLE OPERATIONS DURING EASTERN REPAIR BY S.S. "BUCCANEER." JULY, 1903.



*Length in Circuit when Test taken=63·845 N.M. When Cable cut at Tank end, this left 1·66 N.M. remaining in Tank. These Values, therefore, include the Resistance of the 1·66 N.M. of Tank Cable cut out.

S.S. "BUCCANEER." JULY, 1903.

HAVRE—WATERVILLE (1885) SECTION.

Values.	Date.	Length.	C.R.		I.C.	D.R. abs.	Remarks.
			At 75° Fahr.	At Sea Temp.			
		N.M.	ohms.	ohms.	mfds.	megs.	
Original ...	16.3.03	510·831	8664·825	...	158·902	10·8	
Total Difference	...	0·452	8·704	...	0·258	...	
Present ...	...	511·373	8673·529	...	159·160	...	

SHEET TOTALS.

Sheet.	Length.	C.R.		I.C.	Tru · C.R.'s to positions indicated by the reference numbers on the Section Sheets.
		At 75° Fahr.	At Sea Temp.		
	N.M.	ohms.	ohms.	mfds.	
A	79·554	1120·126	...	22·299	
B	142·254	2390·280	...	44·117	
C	192·878	3321·451	...	60·613	
D	105·687	1841·672	...	32·131	
TOTALS	511·373	8673·529	...	159·160	

FINAL TESTS AFTER THIS REPAIR.

TAKEN AT WATERVILLE.
22.7.03.

C.R. ex Land Lines.		D.R. per N.M., at 10th minute.
To H.R.	C.H. 8483·$^{\omega}$ at Waterville	Zinc to Line = 4602·$^{\Omega}$
To	C.H.	Copper „ = 4985·$^{\Omega}$

Ship.	Date.	Type.	Sheathing.	Core.	Length in N.M.		C.R. at 75° F. ω			Capacity. mfds.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
BLEVILLE.													F.	Fms.		
"Faraday" ..	Feb. '85	1812	10/9	70/75	·110		17·41	1·192		·309	·034				1	
Original	,,	Beach	10/9	,,	·050	·160	,,	·87	2·79	,,	·015	·049			2	
,, ...	,,	8517	10/·143″ 12x3/·220″	,,	1·000	1·160	,,	17·41	20·20	,,	·309	·358			3	
,, ...	,,	8516	10/·143″ 12x3/·350″	,,	6·000	7·160	,,	104·47	124·67	,,	1·854	2·212			4	
,, ...	,,	8515	10/·325″	,,	9·000	16·160	,,	156·70	281·37	,,	2·782	4·994			5	
,, ...	,,	8514	10/·250″	,,	4·472	20·632	,,	77·83	359·20	,,	1·382	6·376			6	
"Amber"	2.2.01	Bt.	10/6	130/130 bt.	2·892	23·524	9·30	26·89	386·09	·350	1·012	7·388	47	23	7	
Original	1885	8514	10/3 t	70/75	9·228	32·752	17·41	160·76	546·79	·310	2·861	10·249			8	
"Mirror"	April, '98	By.	10/6	130/130 bt.	0·407	33·159	9·16	3·73	550·52	·327	·133	10·382	46	20	9	
,, relaid ..	,,	8514	10/3 t	70/75	3·411	36·570	17·41	59·38	609·90	·309	1·054	11·436	47	21	10	
Original	1885	,,	,,	,,	12·813	49·383	,,	223·00	832·90	·310	3·970	15·406			11	
"Mirror"	3.9.99	B.	10/6 y	130/130 bt.	·845	50·228	9·186	7·76	840·66	·327	·276	15·682	65	30-34	12	
"Marmion" ..	27.1.95	8514	10/3 t	70/75	1·290	51·518	16·620	21·44	862·10	·357	·460	16·142		27	13	
Original	1885	,,	,,	,,	7·492	59·010	17·405	130·40	992·50	·309	2·315	18·457		30	14	
"Mirror," 16.5.98.. Relaid by "Buccaneer"	22.7.03	By.	10/6	130/130	1·220	60·230	9·18	11·200	1003·70	·327	·399	18·856		36	15	
"Buccaneer" ..	,,	8514	10/3 y	70/75	1·618	61·848	17·03	27·554	1031·254	·356	·576	19·432			16	
,, ..	,,	,,	,,	,,	0·327	62·175	,,	5·569	1036·823	,,	·116	19·548			17	
"Mirror"	16.5.98	By.	10/6	130/130 bt.	1·012	63·187	9·18	9·290	1046·113	·327	·331	19·879			18	
"J. Pender" ..	16.2.03	,,	,,	107/140 bt.	1·530	64·717	12·129	18·557	1064·670	·300	·459	20 338	45·5	38	19	
,, ..	,,	,,	,,	120/175 bt.	1·200	65·917	10·45	12·540	1077·210	·309	·371	20·709			20	
"Mirror"	21.11.02	,,	,,	130/130 bt.	4·637	70·554	9·256	42·916	1120·126	·343	1·590	22·299	46	35	21	

HAVRE—WATERVILLE SECTION.

SHEET B.

Ship.	Date.	Type.	Sheathing.	Core.	Length in N.M.		C.R. at 75° F. ω			Capacity. mfds.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
													F.	Fms.		
Original ..	1885	8514	$^{10}/_{3}$ t	$^{70}/_{75}$	·251		17·388	4·364		·309	·077				1	
"Britannia"..	5.2.03	„	$^{10}/_{3}$ y	„	4·530	4·781	16·842	76·293	80·657	„	1·400	1·477	49	43	2	
Original ..	1885	„	$^{10}/_{3}$ t	„	·570	5·351	17·388	9·919	90·567	„	·176	1·653			3	
"Buccaneer"	5.2.02	„	$^{10}/_{3}$	„	2·154	7·505	17·200	37·050	127·62	·356	·767	2·420	47		4	
Original ..	1885	„	$^{10}/_{3}$ t	„	41·267	48·772	17·388	717·580	845·20	·309	12·757	15·177			5	
"Amber" ..	22.11.00	Bt.	$^{10}/_{6}$	$^{130}/_{130}$ bt.	3·251	52·023	9·265	30·120	875·32	·337	1·095	16·272	54·5	38-36	6	
Original ..	1885	8513A	$^{10}/_{7}$	$^{70}/_{75}$	13·994	66·017	17·527	245·300	1120·62	·301	4·215	20·487		„	7	
"Chiltern" ..	19.2.01	By.	$^{10}/_{6}$	$^{120}/_{175}$	1·593	67·610	10·338	16·470	1137·09	·296	·471	20·958	49	„	8	
„ ..	„	„	„	$^{130}/_{130}$ bt.	4·189	71·799	9·281	38·880	1175·97	·354	1·483	22·441		„	9	
„ ..	„	8513A	$^{10}/_{7}$ t	$^{70}/_{75}$	3·321	75·120	17·250	57·280	1233·25	·309	1·026	23·467	48	„	10	
Original ..	1885	„	„	„	20·239	95·359	17·5 4	354·900	1588·15	·301	6·095	29·562			11	
"Electra" ..	12.6.99	„	„	„	·445	95·804	17·250	7·670	1595·82	·310	·138	29·700	53	43	12	
„ ..	„	„	„	„	8·545	104·349	„	147·400	1743·22	„	2·649	32·349	„	„	13	
„ ..	„	By.	$^{10}/_{6}$	$^{130}/_{130}$ bt.	0·260	104·609	9·160	2·380	1745·60	·315	·082	32·431	„	45	14	
Original ..	1885	8513A	$^{10}/_{7}$ t	$^{70}/_{75}$	36·875	141·484	17·250	636·000	2381·60	·3106	11·455	43·886			15	
"Bittern" ..	Oct. '95	8147	—	$^{107}/_{140}$	0·770	142·254	11·273	8·680	2390·28	·300	·231	44·117			16	

HAVRE—WATERVILLE SECTION.

Ship.	Date.	Type.	Sheathing.	Core.	Length in N.M.		C.R. at 75° F. ω			Capacity. mfds.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
						212·593			3507·383			66·256	F.	Fms.		
Original	1885	8513A	$10/7$ t	$70/75$	6·307		17·25	108·800		·3106	1·959				1	
"Marmion"	Oct. '96	8514	$10/3$ t	„	2·787	9 094	16·62	46·320	155·120	·357	·995	2·954		57	2	
Original	1885	8513A	$10/7$ t	„	·724	9·818	17·35	12·560	167·680	·3108	·225	3·179			3	
„	„	8513	$10/8$	„	33·111	42 929	17·343	574·24	741·920	„	10·290	13·469			4	
„	„	„	„	„	48·889	91·818	17·50	855·36	1597·280	·3228	15·783	29·252			5	
„	„	8512	$10/9$ t	„	7·190	99·008	17·45	125·47	1722·750	·3054	2·196	31·448			6	
"Buccaneer" ..	8.9.02	„	„	„	3·970	102·978	17·02	67·57	1790·320	·332	1·318	32·766	50	63	7	
Original	1885	„	„	„	16·292	119·270	17·45	284·295	2074·615	·3054	4·975	37·741			8	
"Buccaneer" ..	5.7.03	„	$10/9$ y	„	1·529	120·799	„	26·681	2101·296	„	·467	38·207	54·5	68	9	
Picked up and relaid	„	„	$10/9$ t	„	·636	121·435	„	11·098	2112·394	„	·194	38·402			10	
Original	1885	„	„	„	14·493	135·928	„	252·907	2365·301	„	4·426	42·828			11	
„	„	„	„	„	48·788	184·716	17·312	844·600	3209·901	·311	15·160	57·988			12	
"Mirror"	Oct.-Nov. '99	„	„	„	1·258	185·974	17·323	21·770	3231·671	·309	·391	58·379	54	70	13	
„	„	„	„	„	2·409	188·383	„	41·770	3273·441	„	·748	59·127			14	
.. ..	„	B tape	$10/6$	$107/140$ bt.	2·822	191·205	11·596	32·720	3306·161	·328	·926	60·053			15	
„	„	D tape	$12/3$	$130/130$	1·673	192·873	9·142	15·290	3321·451	·335	·560	60·613	53	75	16	

HAVRE—WATERVILLE SECTION.

Ship.	Date.	Type.	Sheathing.	Core.	Length in N.M.		C.R. at 75° F. ω			Capacity. mfds.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
													F.	Fms.		
Original ..	1885	8512	$10/9$ t	$70/75$	13·080		17·31	226 45		·3108	4·065			80-65	1	
„ ..	„	„	„	„	67·201	80·281	17·52	1177·17	1403·62	·3028	20·347	24·417		„	2	
„ ..	„	„	„	„	1·244	81·525	17·38	21·62	1425·24	·3035	·377	24·794		„	3	
„ ..	„	8513	$10/8$ t	„	2·000	83·525	17·376	34·752	1459·992	„	·607	25·401		70	4	
„ ..	„	8514	$10/3$	„	4·000	87·525	„	69 504	1529·496	„	1·214	26·615		55	5	
„ ..	„	8515	$10/0$ t	„	7·642	95·167	„	132·790	1662·286	„	2·319	28·934			6	
"J. Pender" ..	March, '03	Ey	$10/2$	$107/140$ bt.	0·510	95·677	11·199	5·710	1667·996	·3147	·160	29·094	47·75	43	7	
"Britannia" ..	12.2.03	8514	$10/3$ y	$70/75$	0·660	96·337	16·985	11·210	1679·206	·3035	·200	29·294	47	38	8	
Original ..	1885	8515	$10/0$	„	0·300	96·637	17·376	5·213	1684·419	„	·091	29·385			9	
„ ..	„	8516	$10/9$ $12/·350''$	„	8·000	104·637	„	139·008	1823·427	„	2·428	31·813		10-38	10	
„ '85, Pt.	Twin Core	8517	$10/9$ $12x3/·220''$	„	1·000	105·637	„	17·376	1840·803	„	·303	32·116			11	
„ Beach	„	8512	$10/9$	„	0·050	105·687	„	0·869	1841·672	„	·015	32·131			12	
Original Trench Line.		Twin	Core	„	0·221											

DISTRIBUTION OF CABLE IN TANKS ON BOARD S.S. "BUCCANEER" ON RETURN TO THE SILVERTOWN WORKS, JULY 23RD, 1903.

AFTER TANK.

Type	Factory No.	Core.		Length. N.M.
H.I.	8514	$^{70}/_{75}$	=	0·5591
H.I.	„	$^{70}/_{75}$	=	0·3804
L.I.	8513	$^{70}/_{75}$	=	0·2200
H.I.	8514	$^{70}/_{75}$	=	0·5000
Int. Sec. 4	02664	$^{130}/_{130}$	=	2·0000
H. p. u.	8502	$^{450}/_{270}$	=	1·178
L.D.S. 10 pt. B	2147	$^{225}/_{225}$	=	10·969
L.D.S. 10 pt. B	„	$^{225}/_{225}$	=	3·000
Part Piece 5	8512	$^{70}/_{75}$	=	1·161
Part Piece 6	„	$^{70}/_{75}$	=	1·636
Part Piece 4	„	$^{70}/_{75}$	=	0·994
Twin Core	8553	$^{90}/_{85}$	=	1·1085
Piece 3, Twin,	8552	$^{90}/_{85}$	=	0·053
Piece 2, Twin	„	$^{90}/_{85}$	=	0·243
Piece 1, „	„	$^{90}/_{85}$	=	2·708
Piece 4, „	„	$^{90}/_{85}$	=	0·050

FORE TANK.

Type.	Factory No.	Core.		Length. N.M.
Piece "N"	8514	$^{70}/_{75}$	=	0·132
Piece "M"	„	$^{70}/_{75}$	=	0·187

FORE HOLD.

Type.	Factory No.	Core.		Length. N.M.
*Piece "K"	8502	$^{450}/_{270}$	=	0·083
*Piece "G"	„	$^{450}/_{270}$	=	0·157
*Piece "C"	8512	$^{70}/_{75}$	=	0·894
*Piece "B"	„	$^{70}/_{75}$	=	0·200

*Transferred (since Ship's return) to Fore Tank.

Factory Electrical Values at 75° F. of Cable on Board S.S. "Buccaneer" on Return to Silvertown, 23.7.03.

AFTER TANK.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total	Per N.M.	Total	Per N.M.	Total	Per N.M.	
H.I.	Core									Top.
8514	70/75	0·5591		9·521	17·03	0·1990	0·356	683	382	
H.I.										
8514	„	0·3804		6·478	„	0·1345	„	1004·2	„	
L.I.										
8513	„	0·2200		3·747	„	0·0783	„	1736·4	„	
H.I.										
8514	„	0·5000		8·515	„	0·1780	„	764	„	
		1·6595		28·261	17·03	0·5907	0·356	230·1	382	
Int. 4										
02664	130/130	2·000		18·456	9·228	0·7186	0·3593	247	494	
Pce. "H"										
8502	450/270	1·1780		3·218	2·732	0·4901	0·4160	—	—	p. u. Cs.—Wv. Repair
L.D.S.										
10 pt. B										
2147	225/225	10·969		58·410	5·325	3·9237	0·3577	67·92	745	
L.D.S.										
10 pt. B										
2147	„	3·000		15·987	5·329	1·0996	0·3665	277·7	833	
Main										
Pt. Pce. 5										
8512	70/75	0·537		9·371	17·451	0·1640	0·3054	—	—	
		0·624		10·620	17·020	0·2072	0·3320	—	—	
		1·161		19·991	17·219	0·3712	0·3197	—	—	
Main										
Pt. Pce. 6										
8512	„	0 304		5·305	17·451	0·0929	0·3054	—	—	
		1·332		23·245	„	0·4068	„	—	—	
Main		1·636		28·550	17·451	0·4997	0·3054	—	—	
Pt. Pce. 4										
8512	„	0·994		16·91	17·02	0·3300	0·3320	583	580	
Twin	90/85									
8553	No. 1	1·1085	1·1210	14·720	13·13	0·3704	0·3304	2132	2390	
	No. 2			14·730	13·14	0·3689	0·3291	2618	2935	
Piece 3										
8552	Plain 1	0·053	0·054	0·718	13·29	0·0162	0·2993	—	—	
	Rib 2			0·716	13·26	0·0159	0·2950	—	—	
Piece 2										"Buccaneer," 30.7.02.
8552	Plain 1	0·243	0·2457	3·265	13·29	0·0735	0·2993	—	—	
	Rib 2			3·258	13·26	0·0725	0·2950	—	—	
Piece 1										"Buccaneer" 30.7.02.
8552	Plain 1	2·708	2·738	36·389	13·29	0·8196	0·2993	—	—	
	Rib 2			36·305	13·26	0·8078	0·2950	—	—	
Piece 4										"Buccaneer," 30.7.02.
8552	Plain 1	0·050	0·0506	0·6645	13·29	0·0151	0·2993	—	—	
	Rib 2			0·6710	13·26	0·0149	0·2950	—	—	
	The above pieces of Type No. 8552 as spliced up.									
Twin										
8552	Plain 1	3·054	3·089	41·037	13·29	0·9244	0·2993	—	—	
	Rib 2			40·950	13 26	0·9111	0·2950	—	—	Bottom.

FACTORY ELECTRICAL VALUES AT 75° F.

OF CABLE ON BOARD S.S. "BUCCANEER" ON RETURN TO SILVERTOWN, JULY 23RD, 1903.

FORE TANK.

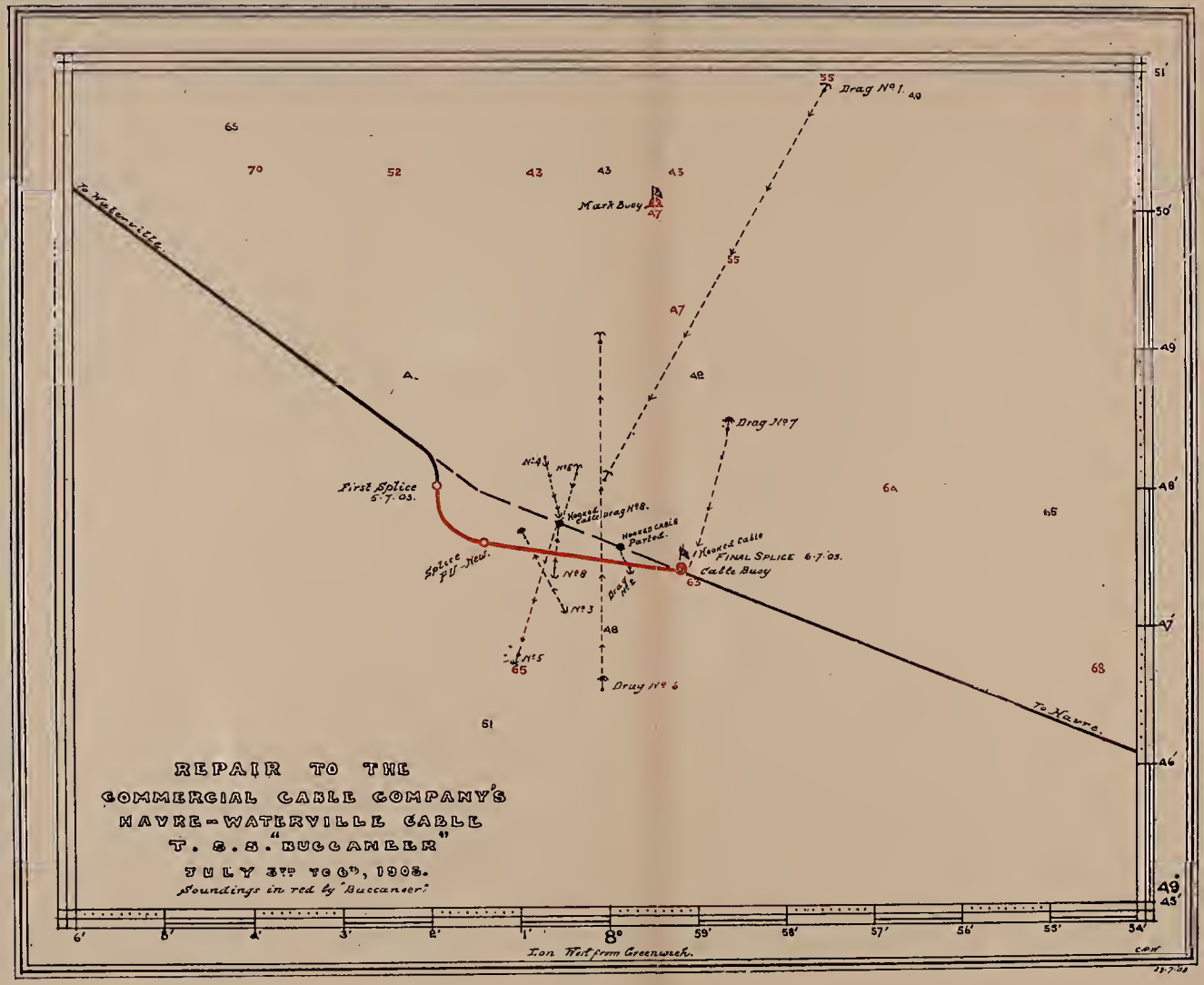
Type.	Sectn.	Fac. No.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
				Cable.	Core.	Total.	Per N.M.	Total.	Per N.M.	Total.	Per N.M.	
			Core			Ohms.	Ohms.	Mfds.	Mfds.	Megs.	Megs.	
	Piece											
Main	"B"	8512	$^{70}/_{75}$	0·200		3·490	17·45	0·0611	0·3054			Picked up during Western Repair, July, 1903.
„	"C"	„	„	0·894		15·600	„	0·2730	„			
	"G"	8502	$^{450}/_{270}$	0·157		0·4289	2·732	0·0653	0·4160			Picked up during Northern Repair, July, 1903.
	"K"	„	„	0·083		0·2268	„	0·0345	„			
	"N"	8514	$^{70}/_{75}$	0·132		2·297	17·405	0·0408	0·309			Picked up during Eastern Repair, July, 1903.
	"M"	„	„	0·187		3·255	„	0·0578	„			

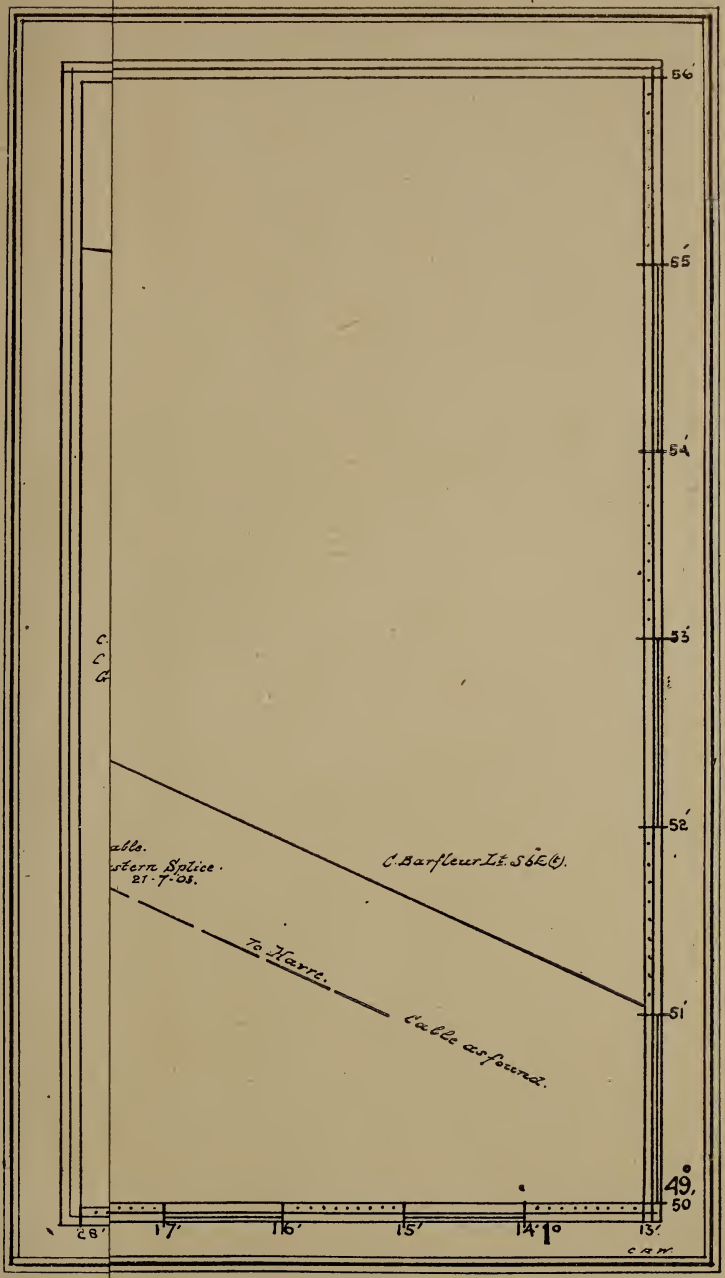
FACTORY ELECTRICAL VALUES AT 75° F.

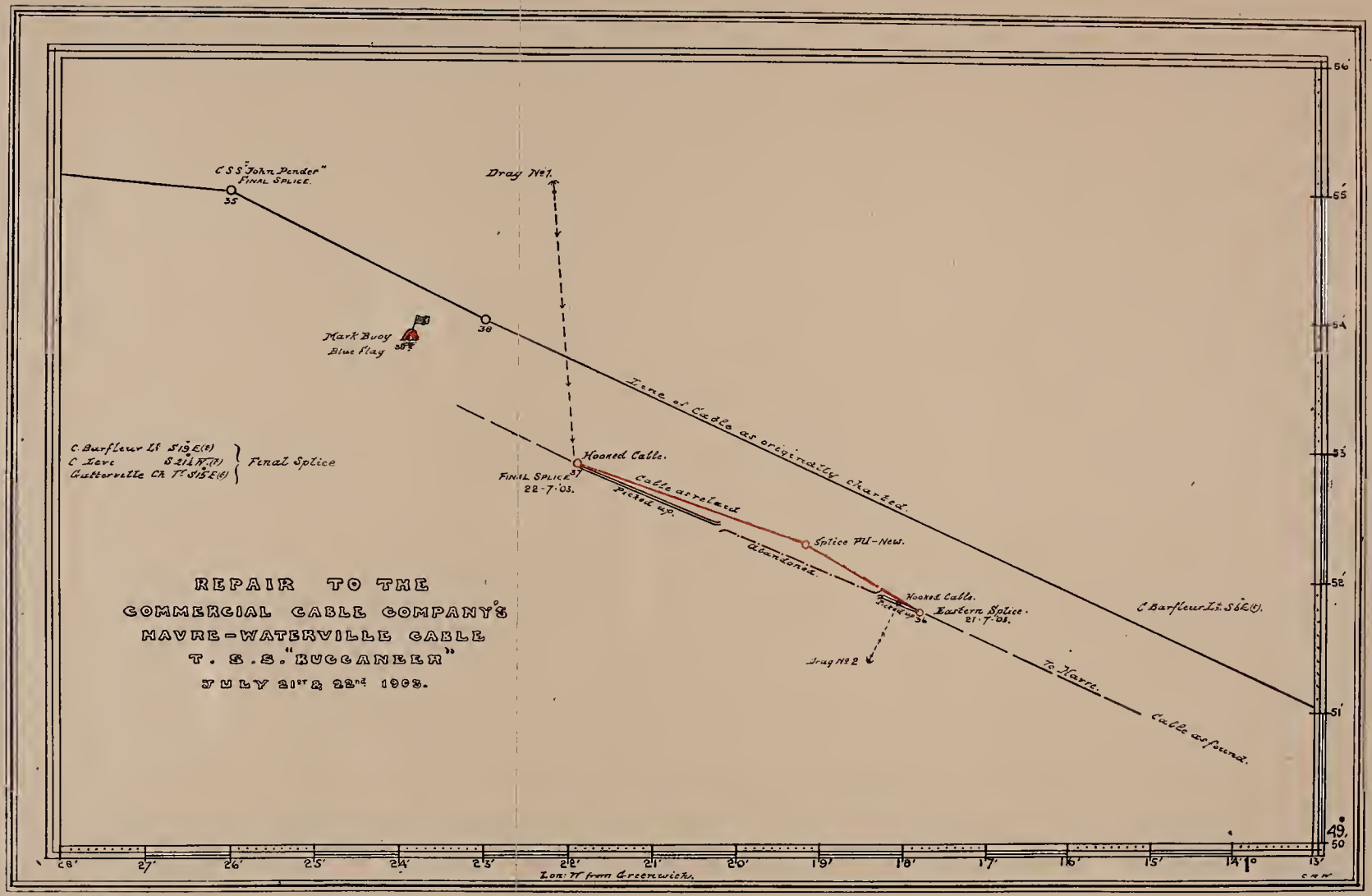
OF CABLE ON BOARD S.S. "BUCCANEER" ON RETURN TO SILVERTOWN, JULY 23RD, 1903.

FORE TANK.

Type.	Sectn.	Fac. No.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
				Cable.	Core.	Total.	Per N.M.	Total.	Per N.M.	Total.	Per N.M.	
			Core			Ohms.	Ohms.	Mfds.	Mfds.	Megs.	Megs.	
	Piece											
Main	"B"	8512	$^{70}/_{75}$	0·200		3·490	17·45	0·0611	0·3054			Picked up during Western Repair, July, 1903.
„	"C"	„	„	0·894		15·600	„	0·2730	„			
	"G"	8502	$^{450}/_{270}$	0·157		0·4289	2·732	0·0653	0·4160			Picked up during Northern Repair, July, 1903.
	"K"	„	„	0·083		0·2268	„	0·0345	„			
	"N"	8514	$^{70}/_{75}$	0·132		2·297	17·405	0·0408	0·309			Picked up during Eastern Repair, July, 1903.
	"M"	„	„	0·187		3·255	„	0·0578	„			


REPAIR TO THE
COMMERCIAL CABLE COMPANY'S
HAVRE-WATERVILLE CABLE
T. S. S. "BUCCANEER"
JULY 3RD TO 6TH, 1903.
Soundings in red by "Buccaneer."
To Waterville.
To Havre.
Drag No 1.
Mark Buoy
Drag No 7
First Splice 5.7.03.
Hooked Cable
Drag No 8.
Hooked Cable Parted.
Hooked Cable
FINAL SPLICE 6.7.03.
Cable Buoy
Splice PU-New.
No 8
No 3
No 5
Drag No 6
Ion West from Greenwich.


56'
55'
54'
53'
52'
51'
49°
50
28'
17'
16'
15'
14'
1°
13'
C.
C
G
able.
stern Splice.
21·7·08.
C. Barfleur Lt. S6E(t).
To Havre.
Cable as found.
C.A.W.



REPAIR TO THE COMMERCIAL CABLE COMPANY'S HAVRE-WATERVILLE CABLE T. S. S. "BUCCANEER"

JULY 21st & 22nd 1903.

WATERVILLE—CANSO (1884) CABLE REPAIR.

S.S. "BUCCANEER."

ELECTRICAL REPORT.

ELECTRICAL REPORT.

WATERVILLE—CANSO (1884) CABLE REPAIR.

ELECTRICAL REPORT.

WATERVILLE—CANSO (1884) CABLE REPAIR.

F. C. Crawford, Esq.,
Engineer-in-Charge,
S.S. "Buccaneer."

Dear Sir,

Whilst engaged on the Western repair—off Scillys,—to the Havre—Waterville Cable, a service message was received by Mr. Gott, from Waterville, on July 5th, 5.40 p.m., notifying him that "Fourth fault of 20000 ohms. resistance appeared in Northern yesterday, our tests useless. Canso makes 614 added to loop, 140 ohms. from here," and also another from V. P. "Can 'Buccaneer' proceed, after repairing Havre, to take out fault in Northern. Have you cable on board?"

Having over 16 n.m. of S.A. Cable, Type No. 2147[A] and No. 2147 on board—which was suitable for this repair—Mr. Gott decided, after completion of Western repair, to leave the Eastern fault in cable for the present and proceed direct to Waterville and remove the fault in the Northern, and notified the V.P. by S.G. to that effect (July 5th, 8 p.m.). Accordingly, after slipping Final Splice—Western repair—and picking up mark buoy, at 10.35 a.m. the "Buccaneer" set on full speed for Waterville, where she arrived and anchored off Cable Station at 6.50 a.m. July 7th.

As mentioned in the Electrical Report of the Havre—Waterville Eastern repair, Messrs. Gott & Cann went ashore at 8.45 a.m. same morning to locate the faults in the Canso—Waterville and Waterville—Havre cables. No reliable tests being possible from Waterville on the Northern, Canso's tests were accepted, and these placed the

fault at about 50 N.M. from Waterville. Before going ashore the cable intended to be used on this repair, viz., S.A. type L.D.S. No. 2147[A] and No. 2147 was tested for D.R. with 200 volts, and gave highly satisfactory results. During the course of the day these two lengths, 3·673 N.M. and 10·978 N.M., were spliced up. At 1.40 p.m. the "Buccaneer" left for Valencia where she anchored at 4.30 p.m., and a hulk, "Dannebrog," having been chartered—for the purpose of turning over the cable in After tank in order to get at the S.A. type which was required for this repair—commenced transferring cable at 9.30 p.m. same night. This operation was concluded and all cable coiled back again in After tank by 2.30 p.m. on 9th inst.

At 3.55 p.m. same day, weighed anchor and proceeded to cable ground, weather thick and misty. Streamed mark buoy at 10 p.m. and then took several soundings, and at 11.30 p.m. set on to cruise off Mark Buoy for the night. The next day, July 10th, no observations could be taken owing to mist which developed at night into a thick fog. Several temperature soundings were taken during the day, and at 8.30 p.m. anchored ship with mushroom and 300 fms. of grappling rope. The following day, July 11th, weather was still too thick for observations, so at 2.10 p.m. ship set on to run distance to Skelligs and back, and then cruised round Mark Buoy for the night. On Sunday, July 12th, the weather was fine, enabling sights to be taken, and at 4.20 p.m. lowered grapnel for Drag 1. During the course of the day 4 drags were made without success.

July 13th. 9 Drags were made during day without success, making 13 in all.

On July 14th, as the wind and sea were increasing, decided at 9.40 a.m. to run for shelter to Valencia, anchoring there at 2.20 p.m.

On our arrival, Mr. Gott received the following S.G.—Waterville, 3.47 p.m., July 14th, 1903, to Gott, Valencia. "Northern parted 10.18 a.m. yesterday, our end insulated. 53 N.M. by Capacity. Canso end earth 6900 ohms."

Note.—A later telegram to Mr. Gott, says, "Total Capacity to sealed end, 21·8 mfds."

July 14th. *Note:*—During the course of the day the fault in H.I. No. 8514 was broken down by the application of 450 volts. Localised same by Varley's loop test and placed fault in splice 0·3804—0·9011 pieces.

July 15th, at anchor, Valencia, weather being still unfavourable for cable work. Turning over cable to get at fault in splice ·3804—·9011 pieces. Splice cut out and fault found in defective joint. The two pieces into which cable had been cut (original length 3 640), were now tested, the 2·5396 N.M. remaining in Fore tank being still weak, giving only 257$^{\Omega}$· per N.M. at 60° F., and the 1·1004 piece "O.K." =890$^{\Omega}$.

Weather improving, weighed anchor at 9.20 a.m., July 16th, and proceeded to cable ground, arriving at 2.20 p.m., when Mark Buoy "K" was picked up, Mark Buoy "T" relighted, and at 4.20 p.m. streamed Mark Buoy 47 and set on to run distance between buoys. At 5.25 p.m. down grapnel for Drag 14, and at 6.15 p.m. had cable at bows. 6.57, end in testing room, called shore, no response. Took ordinary C.R. 20 cells Z.=110$^{\omega}$ C. 121$^{\omega}$; then took H. E. C.'s triple test, obtaining a negative result and reported break close to ship.

The short end was veered away and at 7.30 Canso end was handed to testing room; ship called and received signals, but not intelligible until 9.30 a.m. At 8.24 a.m. end of short piece on board, (L.=0·157 N.M.) Piece "G" mechanically bad, but electrically "O.K." and at 8.31 commenced picking up to fault on Canso side. At 9.50 p.m. ship earthed for Canso to take C.R., Canso getting a C.R. to ship=6885 At 10.7 a.m. ship took C.R. end free at Canso with 20 cells and at 10.40 with 40 cells, when rapid change was noticed, the resistance rising to 5200$^{\omega}$ with ratio 10000$^{\omega}$: 10=5·2$^{\Omega}$* fault inboard.

(*Note.*—At 8.5 p.m. ship obtained varying results, 10000$^{\omega}$, 50000$^{\omega}$, falling to 9000$^{\omega}$, 20 cells to F. Z.)

* The revs. of picking-up drum at this time = 323 ÷ 348 = 0·928 N.M. of Piece "H" picked up when change observed.

10.20 p.m. ship took D.R. on Canso end with 20 cells (end free at Canso) obtaining a total D.R. $=4{\cdot}393\ \Omega$, 1′ Zinc.

10.38 p.m. cut cable, length picked up $=1{\cdot}178$ N.M. of Piece "H" type No. 8502 and ship then took another D.R. test with following result:

20 Cells 1′ Zinc total $=2{\cdot}400\ \Omega$.*

At 11.0 p.m. instructed Canso to test. Canso sent results:

"Z. 5th min. 7135, C. 7890 megs. per N.M.

Tested Piece "H" just picked up. "O.K" with 20 cells,† and at 11.27 p.m. resumed picking up.

July 17th. 0.27 a.m. End sealed on board, and Canso instructed to take D.R. End free (and sealed) on board for 15 minutes. Canso sent results—3rd min. zinc 92880 megs. per N.M., carbon practically same, and at 1.8 p.m. ship took confirmatory test, obtaining a result of—

Total D.R. 1′ zinc $=7{\cdot}894\ \Omega = 18266$ per N.M. at sea temp.

,, 3rd ,, $=12{\cdot}000\ \Omega = 27780$,, ,, ,,

2.45 a.m., Canso end buoyed, end sealed.

4.2 a.m., down grapnel for Waterville end, Drag 15, and cable to bows 4.48. Waterville was called at 5.21 a.m., and at 6.15 ship tested towards Waterville and found cable "O.K.," obtaining a total D.R. 1′ zinc $=150\ \Omega = 7876$ per N.M., the length in circuit between ship and shore being 52·5 N.M. (accepted).

Conductor resistance as measured from ship‡ $=144\ \omega$ corrected.

,, ,, ,, shore $=141{\cdot}5\ \omega$.

* It was afterwards found that the low D.R. value obtained on this 2nd test was due to the testing lead having been unaccountably damaged, it having tested "O.K." just previous to the test.

† See note *re* Piece "H" on p. 129.

‡ Assuming the mean bottom temperature to be 50°·5 F., then this resistance represents a length in circuit of 53·277 N.M.—0·220 (L.L.)=53·057 N.M. to Waterville beach.

About this time received S.G. S. C. S. to Gott.—"Northern insulation sealed end, zinc 48083, carbon 39568 megs. per knot."

At 7 a.m. a Capacity test was taken from ship on Watervilte side (by Null method—end free at Waterville) with following result:

Total Capacity = 21·270 mfds.

NOTE.—By comparison with the 75 sheets, this capacity represents a length in circuit between ship and Waterville = 52·023 N.M., or, deducting 0·220 N.M. for L.L. at Waterville = 51·803 N.M. to Waterville beach.

July 17th. At 9.45 a.m., finished picking up loose end towards Canso, the length picked up being 0·083 N.M., Piece "K."

At 10.15 a.m, took temperature sounding at position of first splice. The joint being finished at 10.30 a.m., between Waterville end and cable in after tank, a test was taken from ship—end free at Waterville.

Length in circuit = 52·5 N.M. + 14·642 (tank cable) = 67·142 N.M.

Total D.R. 1′ zinc = $\frac{\Omega}{120} = \frac{\Omega}{8058}$ per N.M.

The splice was completed at 11.45, and shortly after ship commenced paying out cable to Canso buoyed end, a control test being maintained (20 cells) during paying out.

Position of "Buccaneer's" 1st Splice. July 17th, 1903.

Lat. 51° 40′·7 N
Lon. 11° 30′·6 W } 156 fms. Bot. temp. 50°·6 F.

Canso buoyed end was reached at 0.55 p.m., and from 1.0 to 1.35 ship was engaged in sending and receiving S.G.'s with Waterville. Canso end was handed to testing room at 2.15 p.m.

Canso took D.R. on cable between Canso and ship (end free on board), obtaining 34000 Ω per N.M. end 3rd minute.

At 2.33 p.m., gave out both ends for opening out ready for Final Splice, and, in order to economise time, Canso was not spoken again, as tests were quite satisfactory.

Cut cable in tank at 2.45 p.m. Length expended, No. 2147A = 3·673 N.M.

Ship now took C.R. and D.R. on Waterville end before making Final Splice. The following are the results:
20 Cells.

Conductor resistance, mean total Z. and C. (corrected) = 163·86 ω.

Total D.R., 1st min. zinc = 133·4 Ω = 7492 Ω per N.M. at sea temp.

Length in circuit = 56·165 N.M.

At 3.15, Waterville took C.R. to ship (end to earth on board) = 163·9 ω.

At 3.30 p.m., sent S.G. Gott to S. W. V.—"Please advise Canso to call you on Northern cable in two hours from now. We now make Final Splice. Good-bye."

Waterville end was given out at 3.32 p.m. for Final Splice, the joint being finished at 6.10, splice being completed at 7.0 p.m., and at 7.14 p.m. the Final Splice was slipped and ship set on to pick up Mark Buoys "T" and "B."

Position of "Buccaneer's" Final Splice. 7.14 p.m. July 17th, 1903.

Lat. 51° 42′·5 N
Lon. 11° 34′·9 W
Depth 219 fms. Bot. temp. 50°·7 F.

Both buoys and moorings being on board at 8.35 p.m., set on for Skelligs, and at 5.0 a.m. the following morning, July 18th, landed Pilot O'Neill off Horse Island and set on full-speed for Portland to take in coal and provisions before effecting the Eastern repair to the Havre—Waterville Cable.

NOTE.—Waterville's test taken after repair Northern by "Buccaneer"—"Northern tenth minute Zinc and Copper, 37320 megs. per N.M."

N.B.—The fault (Piece "H," L = 1·178 N.M.) sealed up rapidly after coming inboard, a test taken at noon same day giving 100 Ω total, which after the application of 560 volts for 20 mins. fell to 60 Ω. At 3.51 fault sealed again very rapidly and remained so. This

piece will be tested periodically and the fault broken down by ordinary means if possible.

In the Appendix will be found the following Tables, etc.:

Revised lengths and 75° values of section after repair.

Tests from ship and shore towards Waterville and Canso on picking up ends.

Tests from ship and shore towards Waterville and Canso before making Final Splice.

Distribution of cable in tanks and 75° values *before* and *after* repair.

Expenditure tables of new and picked up cable.

Diagram of operations, etc., during repair, etc.

I am, dear Sir,

Yours faithfully,

HERBERT E. CANN,

Electrician.

WATERVILLE—CANSO (1884) NORTHERN REPAIR.

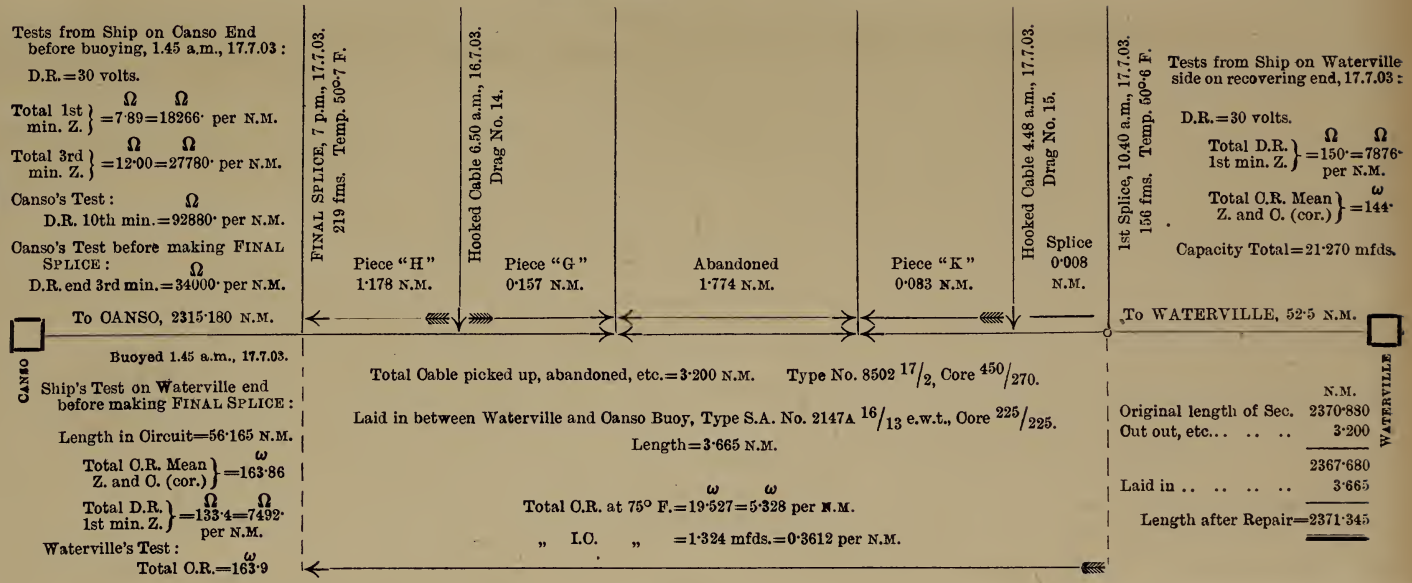
FACTORY ELECTRICAL VALUES AT 75° F. AFTER REPAIR BY S.S. "BUCCANEER." JULY 17TH, 1903.

Ship.	Date.	Type.	Sheathing.	Core.	Length in N.M.		C.R. at 75° F.			Ind. Capacity.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M	Absolute.	Totals.				
							ohms.	ohms.	ohms.	mfds.	mfds.	mfds.	F.	Fms.		
"U. G." ..	1884	4 cores		$^{450}/_{270}$	·200		2 75	·550		·405	·081					
Original ..		Beach	$^{24}/_{15}$	$^{450}/_{270}$	·05	·05	2·7235	·136	·136	·4065	·02	·02				
		8507	$^{18}/_{·099}$ $^{12x3}/_{·220''}$	„	1·1	1·15	„	2·996	3·132	„	·447	·467				
		8506		„	5·0	6·15	„	13·618	16·750	„	2 032	2·499				
		8505		„	·1	6·25	„	·272	17·022	„	·041	2·540				
"J. Pender"..	March, '03	Ey	$^{10}/_{2}$		2·18	8·43	5 946	12·96	29·982	·358	·780	3 320				
"Chiltern" ..	5.2.01	8503	$^{18}/_{·099}$ $^{12}/_{·350''}$	$^{450}/_{270}$	·628	9·058	2 69	1·689	31 671	·434	·272	3·592				
Original ..	1884	8505	$^{12}/_{1}$	„	8·432	17·490	2·723	22 96	54·631	·4068	3·43	7·022				
„ ..	„	8504	$^{12}/_{4}$	„	5·000	22·490	„	13·615	68·246	„	2·034	9·056				
„ ..	„	8503	$^{13}/_{9}$	„	3·000	25·490	„	8 169	76·415	„	1·22	10·276				
„ ..	„	8502	$^{17}/_{2}$	„	13·557	39·047	„	36·916	113·331	„	5 515	15 791				
„ ..	„	„	„	„	13 453	52·500	2 732	36·753	150·084	·4160	5·596	21·387				
"Buccaneer"	17.7.03	2147A	$^{16}/_{13}$ tw.	$^{225}/_{225}$	3·665	56·165	5·328	19·527	169 611	·3612	1·324	22·711	50·7	219		
Original ..	1884	8502	$^{17}/_{2}$	$^{450}/_{270}$	69·417	125·582	2 732	189·648	359·259	·4160	28·877	51·588				
			On to Dover Bay,	Canso.		2245·763			7284·687			837·127				
						2371·345			7643·946			888·715				

WATERVILLE—CANSO (1884) NORTHERN REPAIR.

DIAGRAM SHOWING CABLE OPERATIONS DURING REPAIRS BY S.S. "BUCCANEER."

JULY, 1903.



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DISTRIBUTION OF CABLE IN TANKS ON BOARD S.S. "BUCCANEER" ON LEAVING VALENCIA TO REPAIR NORTHERN CABLE, JULY 9TH, 1903.

AFTER TANK.

Type.	Factory No.	Core.	Piece.		Length. N.M.
L.D.S.	2147A	—	10 pt. "B" pt. 3	=	3·673
„	2147	—	„	=	10·969
„	„	—	„	=	3·000
Main	8512	—	pt. Piece 5	=	1·1610
„	„	—	„ „ 6	=	1·6360
„	„	—	„ „ 4	=	0·9940
L.I.	8553	Twin	—	=	1·1090
Main	8552	„	—	=	3·0540

FORE TANK.

Type.	Factory No.	Piece.		Length. N.M.
Main	8512	Piece "B"	=	0·2000
„	„	„ "C"	=	0·894
Int.	02664	—	=	2·0000
H.I.	8514	—	=	0·5000
L.I.	8513	—	=	0·2204
H.I.	8514	—	=	0·3804
„	„	—	=	0·9011
„	„	—	=	1·6385

Factory Electrical Values at 75° F. of Cable on Board S.S. "Buccaneer" on leaving Valencia, 9.7.03.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F		Remarks.
		Cable	Core	Total	per N.M.	Total	Per N.M.	Total	Per N.M.	
Pce. "B"					FORE	TANK.				Top.
8512		0·200		3·490	17·45	0·0611	·3054			Pd. up 6.7.03.
Pce. "C"										Havre—
8512		0·894		15·600	,,	0·2730	,,			Waterville
Int. 4										,, ,,
02664		2·000		18·456	9·228	0·7186	·3593	247	494	
H.I.										
8514		0·5000		8·515	17·03	0·1780	0·356	764	382	
L.I.										
8513		0·2200		3·747	,,	0·0783	,,	1736·4	,,	
H.I.										
8514		0·3804		6·478	,,	0·1354	,,	1004·2	,,	
H.I.										
8514		0·9011		15·346	,,	0·3208	,,	423·9	,,	
H.I.										
8514		1·6385		27·904	,,	0·5833	,,	233·14	,,	Bottom.
L.D.S.	Totals	3·6400		61·990	17·03	1·2958	0·356	104·9	382	
10 Pt. B										
Pt. 3					AFTER	TANK.				
2147A		3·673		19·570	5·328	1·3267	·3612	226·25	831	
L.D.S.										"Buc." 7.7.03.
10 Pt. B										
2147		10·969		58·410	5·325	3·9237	·3577	67·92	745	
L.D.S.		14·642		77·980	5·326	5·2504	·3587	52·23	765	
10 Pt. B										
2147		3·000		15·987	5·329	1·0996	·3665	277·7	833	
Main										
Pt. Pce. 5										
8512	Top	0·537		9·371	17·451	0·1640	·3054			
	Bot.	0·624		10·620	17·020	0·2072	·3320			
		1·161		19·991	17·219	0·3712	·3197			
Main										
Piece 6	Top	0·304		5·305	17·451	0·0929	·3054			
8512	Bot.	1·332		23·245	,,	0·4068	,,			
Main		1·636		28·550	17·451	0·4997	·3054			
Piece 4										
8512		0·994		16·91	17·02	0·3300	·3320	583	580	
Twin Core										
8553	No. 1	1·1085	1·1210	14·720	13·13	0·3704	·3304	2132	2390	
	No. 2			14·730	13·14	0·3689	·3291	2618	2935	
Twin Core										
Piece 3										
8552	Plain 1	0·053	0·054	0·718	13·29	0·0162	2993			
	Rib 2			0·716	13·26	0·0159	·2950			
Piece 2										"Buc." 30.7.02.
8552	Plain 1	0·243	0·2457	3·265	13·29	0·0735	2993			
	Rib 2			3·258	13·26	0·0725	·2950			
Piece 1										,, ,,
8552	Plain 1	2·708	2·738	36·389	13·29	0·8196	·2993			
	Rib 2			36·305	13·26	0·8078	·2950			
Piece 4										,, ,,
8552	Plain 1	0·050	0·0506	0·6645	13·29	0·0151	·2993			
	Rib 2			0·6710	13·26	0·0149	·2950			
		The above pieces of Type No. 8552 as spliced up.								
Twin Core										
8552	Plain 1	3·054	3·089	41·037	13·29	0·9244	·2993			
	Rib 2			40·950	13·26	0·9111	·2950			Bottom.

WATERVILLE—CANSO (1884) NORTHERN.

REPAIRS BY S.S. "BUCCANEER," JULY, 1903.

CABLE CUT OUT OF SECTION.

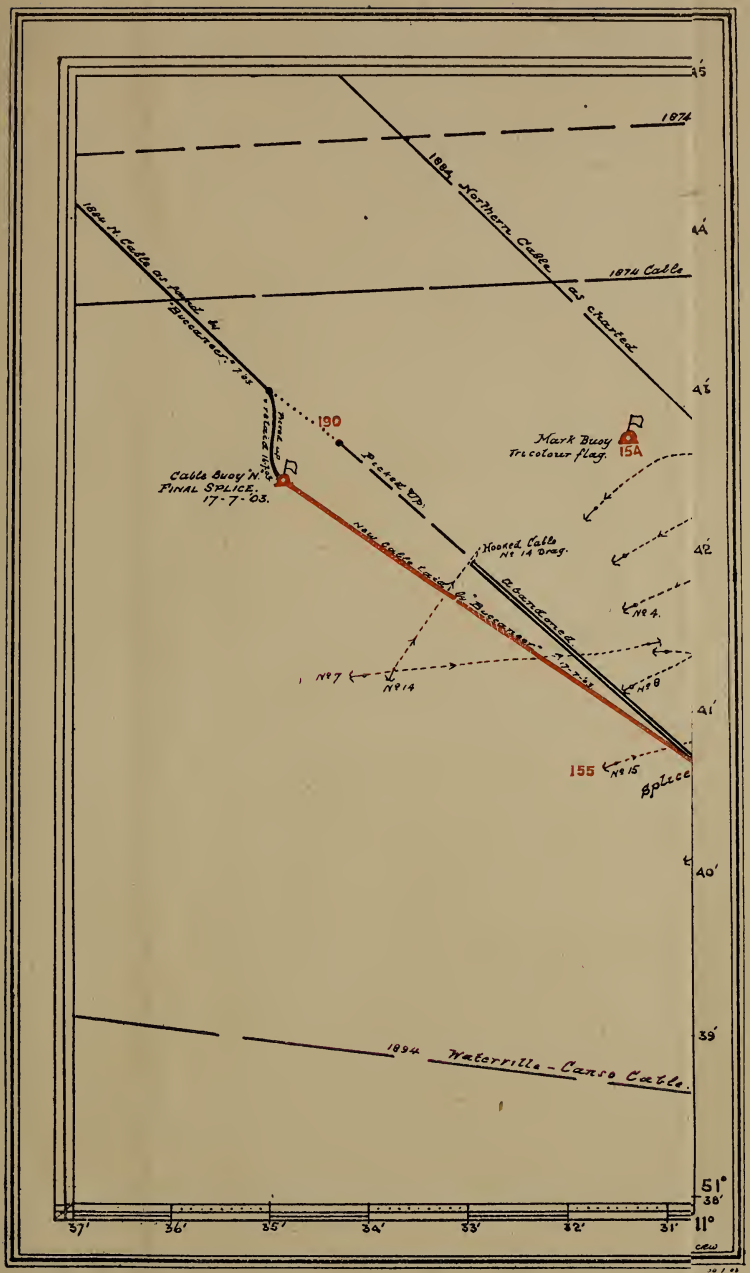
		Type.	Core.		N.M.	Sheathing.
Picked up.	Piece "G."	8502	$^{450}/_{270}$	=	0·157	$^{17}/_{2}$
,, ,,	,, "H."	,,	,,	=	1·178	
,, ,,	,, "K."	,,	,,	=	0·083	
Abandoned		,,	,,	=	1·774	
Cut off Waterville end for Splice.				=	0·008	
			Total	=	3·200	

EXPENDITURE OF CABLE.

	Core.			N.M.
SA. No. 2147A	$^{225}/_{225}$	$^{16}/_{13}$ cwt.	=	3·673
Cut off for Splice to Canso end			=	0·008
		Total laid in between buoys	=	3·665

	N.M.
Laid in Section	= 3·665
Cut out of Section	= 3·200
Increase in length	= 0·465

	N.M.
Former length of Waterville—Canso Section	= 2370·880
Increase by "Buccaneer"...	= 0·465
Present length	= 2371·345



1874
1884 Northern Cable as charted
1874 Cable
1884 N. Cable as found by "Buccaneer" 7-05
Picked up
190
Picked up
Mark Buoy
Tricolour flag.
15A
Cable Buoy "N."
FINAL SPLICE.
17-7-'03.
New Cable laid by "Buccaneer" 17-7-'03
Hooked Cable
No 14 Drag.
Abandoned
No 4.
No 7
No 14
No 8
155
No 15
Splice
1894 Waterville - Canso Cable.
45'
44'
43'
42'
41'
40'
39'
51°
38'
37'
36'
35'
34'
33'
32'
31'
11°

WATERVILLE—CANSO (1884) NORTHERN.

REPAIRS BY S.S. "BUCCANEER," JULY, 1903.

CABLE CUT OUT OF SECTION.

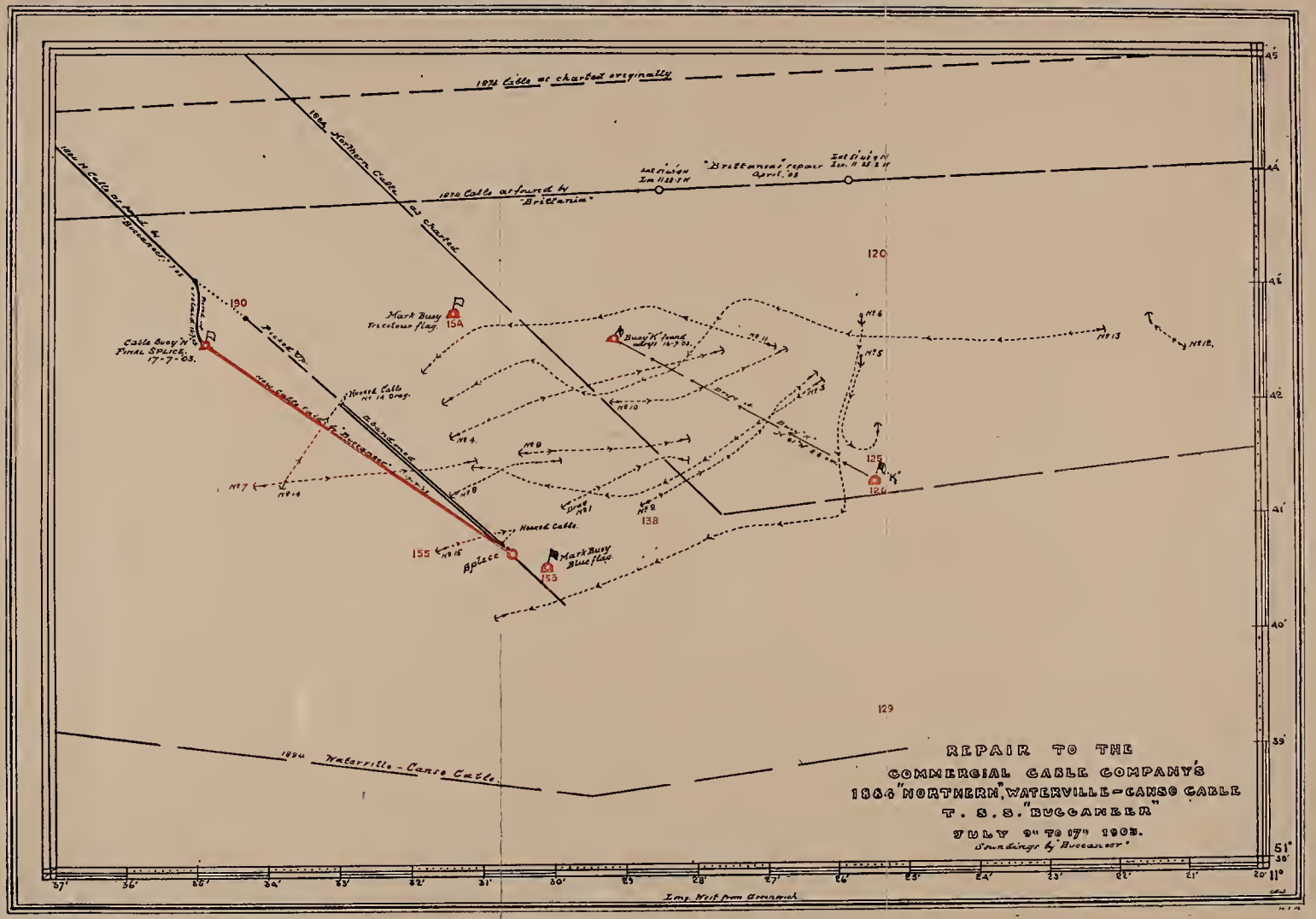
		Type.	Core.		N.M.	Sheathing.
Picked up.	Piece "G."	8502	$^{450}/_{270}$	=	0·157	$^{17}/_{2}$
" "	" "H."	"	"	=	1·178	
" "	" "K."	"	"	=	0·083	
Abandoned		"	"	=	1·774	
Cut off Waterville end for Splice.				=	0·008	
			Total	=	3·200	

EXPENDITURE OF CABLE.

	Core.			N.M.
SA. No. 2147A	$^{225}/_{225}$	$^{16}/_{13}$ cwt.	=	3·673
Cut off for Splice to Canso end			=	0·008
		Total laid in between buoys	=	3·665

	N.M.
Laid in Section ... ... =	3·665
Cut out of Section ... ... =	3·200
Increase in length =	0·465

	N.M.
Former length of Waterville—Canso Section ... ... =	2370·880
Increase by "Buccaneer"... ... ... =	0·465
Present length =	2371·345



1874 Cable as charted originally
1884 Northern Cable as charted
1874 Cable as found by "Brittania"
"Brittania" repair April '03
Mark Busy Tricolour flag
Busy "K" found
Cable Busy "H" FINAL SPLICE 17-7-03
Hooked Cable No 14 Drag
Hooked Cable
Splice
Mark Busy Blue flag
1894 Waterville - Canso Cable
REPAIR TO THE
COMMERCIAL CABLE COMPANY'S
1884 "NORTHERN", WATERVILLE - CANSO CABLE
T. S. S. "BUCCANEER"
JULY 9th TO 17th 1903.
Soundings by "Buccaneer"
Long. West from Greenwich

WESTON—WATERVILLE No. 1 CABLE REPAIR EXPEDITION.

DECEMBER, 1903.

REPAIR

TO THE

Weston—Waterville No. 1 Cable.

S.S. "BUCCANEER."

DECEMBER, 1903.

GENERAL INDEX.

Weston—Waterville No. 1 Cable Repair Expedition, December, 1903.

S.S. "BUCCANEER."

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GENERAL REPORT.

WESTON—WATERVILLE No. 1 CABLE REPAIR.

GENERAL REPORT.

S.S. "Buccaneer,"
January 1*st*, 1904.

M. H. Gray, Esq.,
Silvertown.

Dear Sir,

On December 9th, the S.S. "Buccaneer" was chartered by the Commercial Cable Company to repair the above Cable, the position of fault being given as 1·5 n.m. from Waterville. The ship left Silvertown at 7.45 a.m., December 12th, after taking on board 1·660 n.m. S.E. Cable, No. 8556, and 0·115 n.m. S.E. Cable, No. 8567, barged from Messrs. Siemens', in addition to the Commercial Cable Company's Cable already on board.

On the passage out we encountered strong SE to SW gale, having to take shelter in St. Helen's Bay on the 13th, and to put back from the Lizard to Falmouth on the 15th, being unable to keep our course after rounding the Lizard.

On December 18th we arrived off Waterville and took Pilot O'Neill on board, and, as the weather was unfavourable for working in the Bay, proceeded to Valencia. While there, I went over to Waterville and saw Mr. Wilmot, arranging with him that we should have daily weather reports from Waterville.

On December 19th, as weather was improving, we proceeded to Waterville and put down mark-buoy. Beyond this, work was impossible, as the weather set in thick and obscured the land, so we anchored for the night. On the 20th we made six drags, picking up and slipping twice what we took to be the Havre Cable, and also once the Southern 1884 Cable. I may mention that where we were working there are seven cables within the mile. On the sixth drag

we got the Weston No. 1 Cable, which was recognised by its having *three reverse* lay strands in outer sheathing. As dark was setting in, and blowing from SSE, we were unable to continue work, so after buoying both ends, anchored for the night. As the weather increased during the night, and as our anchorage was not good holding ground, we ran for Valencia at daylight.

On December 24th we picked up Weston and spoke. Tests to Weston "O.K." Waterville end gave dead earth close to ship, and on picking up 0·150 N.M. a bad chafe came in, extending about three feet. Of the outer sheathing only two strands and one wire were standing, and of the inner only seven wires. The cores were scarfed with the chafe, Waterville end being about $\frac{1}{4}$" and Weston $\frac{1}{2}$" with conductor exposed in both cases. The cable on both sides of the 0·150 N.M. cut out was in good condition and no signs of chafe or corrosion. As tests to Waterville were now "O.K." and shoreward cable appeared in good condition, the No. 8567, plus 8556 in after tank, was spliced on, and the final bight slipped at 4.17 a.m., December 25th, in 12$\frac{1}{2}$ fathoms.

The total cable picked up was 0·154 N.M., and put in 0·226 N.M., increasing the length of section by 0·072 N.M.

In the No. 8567 put in there were no "reverse lay" strands in outer sheathing as in original cable, which has *three* strands reverse lay, and in the No. 8556 *both* cores were plain.

At daylight Mr. Cann and myself landed at Waterville, and on hearing from Mr. Wilmot that the final tests were satisfactory and that there were no further instructions for us, the "Buccaneer" left for London at 0.35 p.m., arrived off Gravesend Monday morning, December 28th, and made fast alongside the "Silvertown," Victoria Docks, the same afternoon.

Herewith I enclose copy of Engineer's Log and Electrical Report for the Expedition.

I am, dear Sir,

Yours faithfully,

F. C. CRAWFORD.

WESTON—WATERVILLE No. 1 CABLE REPAIR.

S.S. "BUCCANEER."

DECEMBER, 1903.

LIST OF STAFF, OFFICERS, CABLE HANDS AND CREW.

S.S. "BUCCANEER."

S.S. "BUCCANEER."

LIST OF STAFF, OFFICERS, CABLE HANDS AND CREW.

Mr. F. C. Crawford	...	Engineer in Charge.
,, P. Bates ...	...	Assistant Engineer.
,, H. E. Cann ...	...	Electrician.
,, E. H. Walker	...	Accountant.
Mr. B. C. Combe	...	Captain.
,, J. S. Roberts	...	Chief Officer.
,, V. Jones ...	...	2nd ,,
,, H. D. Emery	...	3rd ,,
W. Mackenzie ...	...	Carpenter.
J. Kelly	...	Boatswain.
C. Collins	...	Boatswain's Mate.
1 Lamp Trimmer.		
4 Quartermasters.		
6 Able Seamen.		
Mr. A. White ...	...	Chief Engineer.
,, W. Macfarlane	...	2nd ,,
,, J. W. Cadman	...	3rd ,,
,, O. Reed ...	...	4th ,,
J. Maguire ...	...	Donkeyman.
A. Gooch	...	Electric Light Driver.
6 Firemen.		
4 Trimmers.		
Mr. A. Patrick ...	...	Chief Steward.
T. Brackett ...	...	2nd Steward and Storekeeper.
T. Williams ...	...	Chief Cook and Baker.
C. Praerman ...	...	2nd Cook and Butcher.
D. Pratt	...	Pantryman.
2 Assistant Stewards.		
1 Scullion.		
1 2nd and 3rd Class Caterer.		
1 Engineers' Steward.		

CABLE HANDS.

W. Tillyer	Foreman.
C. Buckmaster	Leading Hand.
R. Schwartz	Cable Hand.
A. Smith	,, ,,
D. Archard	,, ,,
W. Mack	,, ,,
H. Marshall	,, ,,
A. Harris	,, ,,
H. Livingstone	Fitter.
A. Newton	Fitter's Mate.
R. Malt	Jointer.

SUMMARY.

Staff	4
Cable Hands	11
Officers and Crew	46
Total on board leaving London	61

MECHANICAL DESCRIPTION OF CABLE.

S. S. "BUCCANEER."

MECHANICAL DESCRIPTION OF CABLE.

Siemens' Main Cable, their Factory No. 8512 (Single Core).

Conductor :—Strand of 7 copper wires, "·023, weighing 70 lbs. per N.M.

Dielectric :—Gutta percha, one coat to "·205, weighing 75 lbs. per N.M.

Serving :—Tanned jute yarn.

Sheathing :—10 B.B.G.I. wires, "·143 dia.

Outer Serving :—Two coats of prepared jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 2"·875.

Weight in air, dry = 2·138 tons per N.M.
,, ,, wet = 2·173 ,, ,,
,, in sea water = 1·433 ,, ,,

Siemens' H.I. Cable, their Factory No. 8514 (Single Core).

Conductor :—Strand of 7 copper wires, "·023, weighing 70 lbs. per N.M.

Dielectric :—Gutta percha, "·205, weighing 75 lbs. per N.M.

Serving :—Tanned jute yarn.

Sheathing :—10 B.B.G.I. wires, "·238 dia. when galvanized.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1"·393.

Weight in air, dry = 5·437 tons per N.M.
,, ,, wet = 5·526 ,, ,,
,, in sea water = 3·873 ,, ,,

Siemens' L.I. Cable, their Factory No. 8553 (Twin Core).

Conductor :—Plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs. per N.M.

Two Cores as above, one marked with "Rib," the other "Plain," laid up, wormed and served with tanned jute yarn.

Sheathing :—15 G. Homo. wires, No. 9 L.S.G. = ″·144 dia. when galvanized.

Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1″·103.

Weight in air, dry = 3·293 tons per N.M.
,, ,, wet = 3·420 ,, ,,
,, in sea water = 2·241 ,, ,,

Siemens' Main Cable, their Factory No. 8552 (Twin Core).

Conductor :—Solid plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs. per N.M.

Two Cores as above, one marked with "Rib," the other "Plain," laid up, wormed and served with tanned jute yarn.

Sheathing :—17 G. Homo. wires ″·124 dia. when galvanized.

Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1″·078.

Weight in air, dry = 2·838 tons per N.M.
,, ,, wet = 2·900 ,, ,,
,, in sea water = 1·798 ,, ,,

Siemens' S.E. Cable, their Factory No. 8556 (Twin Core).

Conductor :—Plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs. per N.M.

Two Cores as above, both "Plain," laid up, wormed and served with tanned jute yarn.

Inner Sheathing :—20 B.B.G.I. wires, ″·100 dia.

Serving :—Jute and compound.

Outer Sheathing :—12 B.B.G.I. wires, ″·300 dia.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 1″·916.

Weight in air, dry = 11·65 tons per N.M.

,, in sea water = 8·85 ,, ,,

Siemens' S.E.' Cable, their Factory No. 8567 (Twin Core).

Conductor :—Plain copper wire, weighing 90 lbs. per N.M.

Dielectric :—Gutta percha, weighing 85 lbs per N.M.

Two Cores as above, one marked with "Rib," the other "Plain," laid up, wormed and served with tanned jute yarn.

Inner Sheathing :—20 B.B.G.I. wires, ″·100 dia.

Serving :—Jute and compound.

Outer Sheathing :—12 strands of 3 B.B.G.I. wires, each ″·220 dia.

Outer Serving :—Two coats jute yarn prepared in compound, alternating with three coats of compound.

Ex. diameter = 2″·895.

Weight in air, dry = 18·7 tons per N.M.

,, in sea water = 13·55 ,, ,,

COMMERCIAL CABLE COMPANY'S REPAIRS.

S.S. "BUCCANEER," DECEMBER, 1903.

DRUM COEFFICIENTS.

Circumference of Drum = 17′ 2½″

Type.	Circ. in inches.	Revs. per N.M.	Log.	Fms. per Rev.
Main, 8512 (1 Core) ...	2·875	348·867	2·5426596	2·908
H.I., 8514 „ new ...	4·375	346·385	2·5395594	2·929
„ „ „ old ...	4·250	346·590	2·5398169	2·927
L.I. 8553 (2 Core) ...	3·465	347·886	2·5414375	2·916
Main, 8552 „	3·387	348·016	2·5415988	2·915
S.E. 8567 „	9·093	338·805	2·5299498	2·994
„ 8556 „	6·020	343·704	2·5361847	2·952
Rope 4 × 6	4·646	345·940	2·5390016	2·932
„ 4 × 4	3·860	347·233	2·5406213	2·922
„ 3 × 3	2·700	349·159	2·5430228	2·905

DISTRIBUTION OF CABLE IN SHIP ON LEAVING THE THAMES.

FORE TANK.

Type.	Factory No.	Length. N.M.	Weight. Tons.
S.E.	8567	0·113	2·15
„	8556	1·654	19·85
Main	8512	4·951	10·77
Int.	8514	1·643	9·08
		8·361	41·85

AFTER TANK.

Type.	Factory No.	Length. N.M.	Weight. Tons.
Main	8552	3·006	8·92
Int.	8553	1·108	3·79
		4·114	12·71

SUMMARY.

After Tank	8·361 N.M.	=	41·85 TONS.
Fore Tank	4·114 N.M.	=	12·71 TONS.
TOTAL	12·475 N.M.	=	54·56 TONS.

DISTRIBUTION OF WEIGHT IN SHIP ON LEAVING THE THAMES.

	TONS.
Cable in fore tank	12·71
Ballast in ,, ,, ...	—
Cable in after tank	41·85
Ballast in ,, ,, ...	—
Coal in bunkers	200·00
Fresh water in after fresh water tank	13·00
,, ,, ,, fore cone	8·00
,, ,, ,, side tanks	4·50
Water in ballast tanks forward	70·00
,, ,, ,, aft	—
Boatswain's stores	·75
Cable stores and buoys	12·00
Engine-room stores	2·50
Water in main boilers...	30·00
Steward's stores	7·00
Extra chain cable	1·00
Spare anchors, ropes, etc.	2·00
,, propeller	3·00
Deck machinery	10·00
TOTAL =	418·31 tons

Draught { Forward 11′ 9″ / Aft 14′ 3″ } Mean 13′ 0″

WESTON—WATERVILLE No. 1 CABLE REPAIR.

LEAVING THE THAMES.

S.S. "BUCCANEER."

S.S. "BUCCANEER."

NOTE PREVIOUS TO LEAVING SIVERTOWN.

On Thursday, December 10th, 1903, a barge from Messrs. Siemens Bros. & Co. arrived alongside the "Buccaneer" with 1·660 N.M. of S.E. No. 8556 and 0·115 N.M. of S.E. No. 8567 Cable, belonging to the Commercial Cable Company, which was shipped the same day for the Commercial Cable Company's Repair to the Waterville—Weston No. 1 Section.

LEAVING THE THAMES.

SATURDAY, DECEMBER 12th (1st DAY OUT).

HOUR.	
A.M.	
7.45	Unmoored ship from S.S. "Dacia," and proceeded down river, Pilot Twist in charge.
8.0	Light SE wind and overcast.
8.55	Arrived off Greenhithe.
9.30	Made ship fast to buoy.
11.55	Proceeded to swing ship, assisted by tug "Undaunted."
NOON.	Light SE breeze. Fine and overcast. Bar. 29·59. Ther. 50° F.
P.M.	
0.10	Messrs. Crawford and Cann, with cable hands, joined ship.
1.30	Finished adjusting compass.
1.36	Cast off from buoy and proceeded down river.
2.5	Off Gravesend, eased down. Pilot Twist left ship and Pilot Letten boarded.
3.6	Passed the Mucking.
4.0	Strong SE breeze and cloudy. Bar. 29·52. Ther. 50° F.
5.55	Eased engines.
6.11	Brought up off Nore Light Vessel in 11 fms.

HOUR.	SATURDAY, DEC. 12th (1st DAY OUT)—*Contd.*
P.M.	
8.0	Strong SE wind and overcast. Bar. 29·50. Ther. 50° F.
MID.	Mod. to Fresh SE gale. Overcast and raining. Bar. 29·45. Ther. 50° F.
	SUNDAY, DECEMBER 13th (2nd DAY OUT).
A.M.	
4.0	Mod. SSW breeze. Raining. Bar. 29·45. Ther. 51° F. Hove up and proceeded.
8.0	Similar wind and weather. Bar. 29·45. Ther. 51° F.
8.22	Passed Prince's Channel Light Vessel.
9.4	Passed Margate NE buoy.
9.48	North Foreland Lighthouse abeam.
11.33	South ,, ,, ,,
NOON.	Mod. SSW wind and fine. Ship pitching heavily to high sea. Bar. 29·45. Ther. 50° F.
	STEAMING DOWN CHANNEL.
P.M.	
0.45	Varne Light Vessel abeam.
2.0	Dungeness, N 40° W, 2 N.M.
4.0	Strong S breeze, and considerable sea, ship plunging heavily. Cloudy but fine. Bar. 29·42. Ther. 51° F.
4.47	Royal Sovereign Light Vessel abeam.
5.45	Beachy Head Light, distant 3 N.M.
8.0	Similar wind and weather, shipping water to port. Bar. 29·45. Ther. 51° F.
9.48	Passed Owers Light.
11.2	Eased engines.

HOUR.	SUNDAY, DEC. 13th (2nd DAY OUT)—*Contd.*
P.M. 11.35	Let go anchor in St. Helen's Bay.
MID.	Moderate to fresh SSW gale, cloudy, some rain. Bar. 29·56. Ther. 50° F.
	MONDAY, DECEMBER 14th (3rd DAY OUT).
A.M. 4.0	Light SW breeze and fine. Bar. 29·60. Ther. 52° F.
6.30	Hove up anchor and set on for Ventnor to land Pilot Letten.
8.0	Moderate SW breeze, and fine. Bar. 29·62. Ther. 52° F.
8.26	Off Ventnor Pilot Letten left ship, ship proceeded down Channel.
9.30	Needles abeam.
11.27	Observed Portland Lighthouse.
NOON.	Similar wind, fine and cloudy.
P.M. 0.20	Portland Lighthouse abeam.
4.0	Strong SE breeze, cloudy, moderate sea and swell. Bar. 29·63. Ther. 59° F.
5.5	Eddystone Lighthouse abeam.
8.0	Strong SSE breeze, squally, with rain; heavy sea from starboard.
9.56	Observed Lizard Light.
MID.	Strong SSE breeze, squally with rain. Ship plunging heavily to high sea. Bar. 29·53. Ther. 57° F.
	STEAMING TO FALMOUTH.
	TUESDAY, DECEMBER 15th (4th DAY OUT).
A.M. 0.40	Lizard Lighthouse abeam, distant 8 N.M.
2.56	Heavy SW swell and high S'ly sea. Ship unable to keep course. Rounded to and slowed engines.

HOUR.	TUESDAY, DEC. 15th (4th DAY OUT)—*Contd.*
A.M. 4.0	Strong SSE gale. Cloudy, with rain at times. Similar weather. Keeping Lizard Light in sight.
7.15	Turned ship, directed course to Lizard Light.
8.0	Similar wind and weather, with high confused sea. Bar. 29·49. Ther. 52° F.
8.15	Observed Lizard Lighthouse.
10.50	Manacles abeam.
11.8	Eased engines and took Falmouth Pilot Vincent on board.
11.16	Proceeded towards anchorage.
11.54	Moored ship in Falmouth Harbour.
NOON.	Similar wind and weather. Cloudy and raining. Bar. 29·56. Ther. 52° F.
	ANCHORED IN FALMOUTH HARBOUR.
P.M. 4.0	Moderate SE breeze, overcast and raining. Bar. 29·55. Ther. 60° F.
6.30	Pumped up fore and after cable tanks.
8.0	Strong SE wind and gloomy, overcast, with rain at times. Bar. 29·60. Ther. 68° F.
MID.	Strong SSE breeze, squally, with rain.
	WEDNESDAY, DECEMBER 16th (5th DAY OUT).
A.M. 4.0	Strong SE breeze and occasional fine rain. Bar. 29·47. Ther. 60° F.
8.0	Strong E wind and overcast, with rain at times. Bar. 29·55. Ther. 60° F.
9.30	Mr. Crawford, Captain Combe, and Mr. V. Jones left ship for the Meteorological Office to get weather reports and compare barometers, also to get weather reports from Waterville and the Lizard.
NOON	Fresh ESE breeze with heavy rain. Bar. 29·50. Ther. 58° F.

HOUR.	WEDNESDAY, DEC. 16th (5th DAY OUT)—*Contd.*
P.M.	
4.0	Similar wind and weather. Bar. 29·55. Ther. 56° F.
7.0	Pumped up forward cable tank.
8.0	Moderate ESE breeze, squally, with rain. Bar. 29·58. Ther. 56° F.
10.35	Mr. Crawford, Captain Combe, and Mr. V. Jones returned to ship.
MID.	Moderate ESE breeze, squally, with heavy rain. Bar. 29·61. Ther. 55° F. During the day Mr. Cann tested cable in fore and aft tanks.
	STEAMING TO WATERVILLE.
	THURSDAY, DECEMBER 17th (6th DAY OUT).
A.M.	
4.0	Mod. N'ly breeze and misty. Bar. 29·17. Ther. 52° F.
6.0	Pumped up after cable tank.
6.45	Hove short. Pumped up after ballast tank.
7.41	Hove up anchor and proceeded out of harbour, Pilot Fittock in charge.
8.0	Light NNW breeze. Cloudy and overcast. Bar. 29·75. Ther. 53° F.
8.5	Pilot left ship.
8.37	Manacles abeam.
9.0	Black Head abeam.
9.46	Lizard Lighthouse abeam.
11.36	Longships ,, ,,
NOON.	Light N'ly breeze and fine. Bar. 29·82. Ther. 56° F. Distance run from Falmouth = 46 N.M. Position { Lat. 50° 6′ N. Lon. 5° 51′·5 W.

HOUR.	THURSDAY, DEC. 17th (6th DAY OUT)—*Contd.*
P.M.	
0.43	Seven Stones Light Vessel abeam.
4.0	Light SE breeze and fine. Moderate SW swell. Bar. 29·78. Ther. 60° F.
8.0	Similar wind and weather. Smooth sea. Bar. 29·76. Ther. 59° F.
MID.	Mod. E'ly breeze and fine. Passing clouds. Bar. 29·63. Ther. 58° F.
	FRIDAY, DECEMBER 18th (7th DAY OUT).
A.M.	
3.18	Fastnet Light abeam.
4.0	Strong ESE breeze and following sea. SW swell. Bar. 29·45. Ther. 68° F.
6.3	Bull Rock Light abeam.
8.0	Similar wind and weather. Heavy sea and swell. Bar. 29·43. Ther. 61° F.
9.0	Off Horse Island. Stopped ship and took Pilot O'Neill on board. Decided to proceed to Valencia Harbour on account of weather.
10.47	Passed Valencia Lighthouse.
NOON	Strong ESE breeze. Overcast, with fine rain. Bar. 29·48. Ther. 53° F.
P.M.	
1.0	Pumped up after cable tank. Messrs. Crawford, Cann and Captain Combe left for shore to go to Waterville Cable Station.
4.0	Mod. ESE breeze and raining. Bar. 29·57. Ther. 54° F.
8.0	Fresh ESE breeze. Overcast, rain at times. Bar. 29·65. Ther. 54° F.
MID.	Similar wind and weather. Bar. 29·68. Ther. 55° F.

HOUR.	SATURDAY, DECEMBER 19th (8th DAY OUT).
A.M.	
4.0	Light SSE breeze and fine. Bar. 29·75. Ther. 59° F.
8.0	Similar wind and weather. Bar. 29·75. Ther. 54° F.
10.0	Messrs. Crawford and Cann, with Captain Combe, came on board.
10.25	Hove up anchor and proceeded to Waterville.
11.25	Bray Head Tower abeam.
NOON.	Light SSE wind, with fine rain at times. Heavy W'ly swell. Bar. 29·86. Ther. 60° F.
P.M.	
0.42	Reduced speed in Ballinskellig Bay.
2.0	Dodging around taking angles.
3.0	Slipped Mark Buoy, No. 72, blue flag. Mark Buoy 0·05 N.M. N of ship. Horizontal Angles { Lohar R.C. Church / Old Watch Tower } 75° 00′; { Old Watch Tower / Western Pig Rock } 52° 30′
4.0	Light NNW wind. Misty, and fine rain at times. Bar. 29·87. Ther. 61° F.
4.15	Anchored in 8 fms. with port anchor. Veered to 45 fms. chain.
8.0	Light N'ly breeze, with rain at times. Bar. 29·87. Ther. 62° F.
MID.	Light NNE breeze. Fine, with passing clouds. Bar. 29·92. Ther. 56° F.

ON CABLEGROUND.

	SUNDAY, DECEMBER 20th (9th DAY OUT).
A.M.	
4.0	Light NE'ly airs and fine. Slight mists. Bar. 29·94. Ther. 49° F.
7.15	Hove up anchor and set on for grappling position.

HOUR. A.M.	SUNDAY, DEC. 20th (9th DAY OUT).—*Contd.*
8.40	In position. Lowered short toe ordinary grapnel with centipede trailing, and 10 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 4 grappling rope.
	DRAG No. 1.
8.45	Paid out to 30 fms. of rope.
9.0	No strain. Bottom rocky.
9.5	Strain rose. Commenced picking up.
9.8	Grapnel at bows with cable, 12 wires "·350 dia. This taken to be the Waterville—Havre Section. Cable in good state, one broken wire showing. Position by Horizontal Angles — Lohar R.C. Church / Old Watch Tower } 69° 0′; Old Watch Tower / Western Pig Rock } 47° 45′
9.30	Slipped Waterville—Havre Section with balloon buoy attached, and set on for new position to drag nearer shore.
9.42	Lowered grapnels as in Drag No. 1.
	DRAG No. 2.
9.45	Paid out to 30 fms. of rope.
10.0	Strain rose to 60 cwt. and fell to nil. Rocky bottom.
10.5	Over line of cable. Commenced picking up.
10.7	Decided to resume drag a little further. Paid out again.
10.10	Strain rose. Commenced to pick up.
10.17	Cable at bows. This has every appearance of being the same cable as hooked in Drag No. 1. Decided to slip this. Position — Lohar R.C. Church / Old Watch Tower } 66° 45′; Old Watch Tower / Western Pig Rock } 44° 45′
10.25	Slipped cable. Set on to drag again.
10.30	In position. Lowered grapnels as in Drag No. 2.

HOUR. A.M.	SUNDAY, DEC. 20th (9th DAY OUT)—*Contd.*
	DRAG No. 3.
10.32	Paid out to 30 fms. of 4 × 4 rope.
10.35	Grapnel continually hanging. Strain rising and falling.
10.38	Strain steadily rose to 80 cwt. Commenced picking up. 13 fms. of rope out. Strain suddenly fell to nil.
10.42	Grapnel up. No cable.
11.15	In position. Lowered grapnels as in Drag No. 3.
	DRAG No. 4.
11.17	Paid out to 30 fms. of 4 × 4 rope.
11.30	Over line of cable. Commenced picking up. Grapnels up. No cable. No strain during this drag.
11.40	Observed boat put off from Waterville Beach, set on towards boat.
11.45	Boat came alongside. Mr. Wilmot, Superintendent at Waterville, came on board.
NOON	Mod. SSE breeze. Fine. Passing clouds. Bar. 30·05. Ther. 54° F.
P.M. 0.9	In position. Lowered grapnels as in Drag No. 4.
	DRAG No. 5.
0.11	Paid out to 30 fms. of 4 × 4 rope.
0.45	Strain rose to 80 cwt. and fell to nil. Commenced picking up. Strain whilst picking up = 70—80 cwt.
0.50	Picking up very slowly. Strain = 100 cwt.
1.0	,, ,, ,, ,, 140 cwt.
1.15	Grapnel at bows with cable (one toe gone from ordinary, two toes from centipede). Strain = 140 cwt. Cable very taut.

Position { Lohar R.C. Church } 56° 30′
Old Watch Tower } 40° 30′
Western Pig Rock } Sounding = 13 fms.

HOUR. P.M.	SUNDAY, DEC. 20th (9th DAY OUT)—*Contd.*
1.17	Decided to slip this cable, believing it to be the Southern Section (12/"·350, 2 tapes). Cable in good state. No chafe.
1.30	Slipped cable.
1.40	Changed ordinary and centipede grapnels for one short toe ordinary grapnel.
2.10	In position. Lowered short toe ordinary grapnel with 10 fms. $\frac{3}{4}$" chain, and commenced paying out 4 × 4 rope.
	DRAG No. 6.
2.12	Paid out to 30 fms. 4 × 4 rope.
2.20	Strain rose steadily to 60 cwt. Commenced picking up. 20 fms. of rope out. Strain fell to nil. Paid out again to 30 fms. and resumed drag.
2.35	Strain rose to 80 cwt. Commenced picking up. 20 fms. outboard. Strain fell to nil.
2.37	Grapnel at bows. Lowered away again and resumed drag.
2.43	Strain steadily rose 30—40 cwt. Commenced picking up.
2.45	Grapnel at bows with stranded cable (Weston—Waterville No. 1). Got drum ropes along and made fast to each side of cable. Took grapnel in board.
2.55	Commenced cutting cable.
3.26	Cut cable.
3.45	Hove end towards Waterville on board for testing.
3.51	Commenced testing.
4.0	Mod. SSE breeze. Clear, cloudy weather and fine. Bar. 29·92. Ther. 52° F.
4.15	Finished testing to Waterville. Tests gave earth close to ship. Prepared to buoy end.
4.20	Attached moorings to Waterville end.

HOUR.

SUNDAY, DEC. 20th (9th DAY OUT).—*Contd.*

P.M.

4.30 Let go buoy on Waterville end.

Position { Lohar R.C. Church / Old Watch Tower } 59° 45′ / Western Pig Rock 38° 30′ Sounding = 13 fms.

Moorings.—Buoy No. 71, red flag. 10 fms. of $\frac{3}{8}$″ chain, 10 fms. of $\frac{1}{2}$″ chain. Mushroom = 2 cwt. 1 qr. 10 lbs.

4.35 Hove in Weston end for testing.

4.42 Commenced calling Weston. Preparing to buoy this end, as dark setting in and sea increasing.

4.50 Finished with Weston. Attached moorings to Weston end. Could not read Weston, owing to their employing too strong battery.

4.56 Let go buoy on Weston end. Set on for anchorage. Darkness coming on, making angles unobtainable.

Position { Lohar R.C. Church / Old Watch Tower } 60° 30′ / Western Pig Rock 39° 00′ Sounding = 13 fms.

Moorings.—Buoy No. 63, "N" flag. $\frac{1}{2}$″ bridle, 20 fms. $\frac{5}{8}$″ chain, 10 fms. $\frac{5}{8}$″ chain, $2\frac{1}{2}$ fms. $\frac{3}{4}$″ chain. Mushroom = 2 cwt. 0 qrs. 15 lbs.

5.10 Let go port anchor in 13 fms. Veered to 45 fms. chain.

7.45 Veered to 60 fms. chain.

8.0 Mod. to fresh SE breeze. Overcast and fine.
Bar. 29·96. Ther. 58° F.

MID. Fresh SSE wind. Overcast, with hard squalls.
Bar. 29·89. Ther. 58° F.

ANCHORED AT VALENCIA.

MONDAY, DECEMBER 21st (10th DAY OUT).

A.M.

4.0 Strong gale, SE, with fierce squalls of wind and rain.
Bar. 29·92. Ther. 52° F.

8.0 Similar wind and weather.
Bar. 29·88. Ther. 56° F.
Decided to proceed to Valencia for shelter on account of weather.

HOUR.	MONDAY, DEC. 21st (10th DAY OUT)—*Contd.*
A.M.	
9.10	Hove up anchor and proceeded.
9.25	Hog Head abeam.
10.45	Bray Head abeam.
11.25	Passed Valencia Lighthouse.
11.35	Let go port anchor in Valencia Harbour. Veered to 45 fms. chain.
NOON.	Strong SW wind. Heavy squalls, with rain. Bar. 29·82. Ther. 58° F.
P.M.	
3.30	Mr. Wilmot left ship to proceed to Waterville.
4.0	Similar wind and weather. Bar. 29·72. Ther. 55° F.
8.0	Strong SE breeze. Heavy squalls, with rain. Bar. 29·80. Ther. 56° F.
MID.	Strong SWS breeze and similar weather. Bar. 29·83. Ther. 57° F.
	TUESDAY, DECEMBER 22nd (11th DAY OUT).
A.M.	
4.0	Strong SW breeze to gale. Raining and overcast. Bar. 29·77. Ther. 56° F.
8.0	Similar wind and weather. Bar. 29·76. Ther. 60° F.
NOON.	Strong SSW wind. Fine, cloudy and squally. Bar. 29·78. Ther. 56° F.
P.M.	
4.0	Strong WSW breeze. Cloudy and squally. Bar. 29·77. Ther. 55° F.
8.0	Similar wind and weather. Bar. 29·77. Ther. 55° F.
MID.	Mod. NW wind, with passing rain squalls. Bar. 29·94. Ther. 54° F.

HOUR.	WEDNESDAY, DECEMBER 23rd (12th DAY OUT).
A.M.	
3.30	Hail squall.
4.0	Fresh NW breeze and fine. Bar. 29·98. Ther. 51° F.
8.0	Light variable airs and fine. Bar. 30·06. Ther. 48° F. Getting ready for sea, but on advice from Waterville that heavy sea was running there, decided to remain.
10.0	Mr. Crawford, and Captain Combe and Mr. Cann went ashore at Beginnis Island to observe weather outside. Found heavy sea running in from westward.
NOON.	Light variable airs and fine. Bar. 30·04. Ther. 47° F.
P.M.	
4.0	Calms and fine weather. Heavy surf breaking outside.
8.0	Light variable airs and fine weather. Bar. 30·09. Ther. 51° F.
MID.	Similar wind and weather. Bar. 30·06. Ther. 51° F.
	ON CABLEGROUND.
	THURSDAY, DECEMBER 24th (13th DAY OUT).
A.M.	
4.0	Calms and light airs. Fine. Bar. 30·08. Ther. 48° F.
8.0	Light variable airs and fine. Bar. 30·12. Ther. 48° F.
8.3	Hove up anchor and proceeded to Waterville (Cableground).
10.20	Arrived in Waterville Bay, and up to Buoy "N" on Weston end of cable. Lowered boat and sent her away with drum rope to dismantle buoy.
10.25	Freed buoy from mooring and commenced picking up same.
10.33	Weston end on board.

HOUR.

THURSDAY, DEC. 24th (13th DAY OUT).—*Contd.*

A.M.

10.37 Commenced testing to Weston.

11.40 Captain Combe went away in boat to take soundings and put down mark (oil drum) for ship's depth limit.

11.26 Finished testing to Weston. Sealed end and prepared to buoy same. Cable to Weston "O.K."

11.30 Captain Combe returned to ship.

11.33 Sounded No. 1T—11½ fms. Bot. Temp., 48½° F. Air, 53° F. S.S. 55° F. Ther. No. 134463.

11.45 Commenced paying out moorings on Weston end.

11.50 All moorings paid out. Let go Buoy "V" flag on Weston end.

Moorings.—Buoy No. 63, flag "V." ½" bridle, 30 fms. ⅝" chain, 2½ fms. ¾" chain. Mushroom=2 cwt. 0 qrs. 15 lbs.

11.51 Set on for buoy on Waterville end.

11.55 Up to buoy. Sent boat with drum rope to dismantle buoy.

NOON. Calm. Fine, clear weather.
Bar. 30·15. Ther. 52° F.
Freed buoy from moorings and commenced picking up on Waterville end.

P.M.

0.15 Waterville end on board, off drum. Set indicator to zero and resumed picking up to fault.

Ind.=26 revs.=·078 N.M. Badly chafed.
,, 40 ,, ·120 ,, Splice and broken strand.

0.40 ,, 50 ,, ·150 ,, Very bad place. Core exposed.

0.50 Cut cable at bad place and made fresh tests to Waterville. This bad place proved to be the fault.

1.33 Finished testing to Waterville. Cable "O.K."

1.55 Commenced opening out Waterville end for splice with S.E. Cable, No. 8567, on top in after tank.

2.0 Took Waterville end off drum.

2.30 Got up end of above S.E. from after tank, and commenced opening out same for splice with Waterville end.

HOUR.	THURSDAY, DEC. 24th (13th DAY OUT)—*Contd.*
P.M.	
3.20	Both ends ready for joint and splice.
3.25	Commenced joints.
3.30	Sent boat away to light up buoy on Weston end.
3.42	Boat returned to ship.
4.0	Calm and fine. Bar. 30·21. Ther. 53° F.
5.30	Finished joints and started splice.
7.10	,, splice, and prepared to pay out through stoppers.
7.25	Commenced paying out S.E. Cable, No. 8567, from after tank towards Weston buoyed end. Position of Splice { Lohar R.C. Church / Old Watch Tower } 54° 45′ ; { Western Pig Rock } 35° 30′ By horizontal angles. Sounding = 10 fms.
7.35	Splice S.E. 8567 and H.I. 8556 passed out board.
7.40	Up to buoy on Weston end. Lowered boat, and sent her with drum rope to dismantle buoy.
7.44	Freed buoy from moorings, and commenced picking up Weston end.
8.0	Light airs and calms, with fine weather and heavy dew. Bar. 30·17. Ther. 55° F.
8.7	Enough Weston end inboard for splice. Put hanging ropes and stoppers on cable, and took turns off drum.
8.10	Sent S.G.: "Crawford to Wilmot." "After slipping final will proceed to sea for night, returning to pick up buoys at daylight, and if weather favourable will land; otherwise proceed to Valencia and drive over for tests. Weston end now on board. Please send to-day's weather report."
8.30	Commenced testing to Weston.

HOUR.	THURSDAY, DEC. 24th (13th DAY OUT)—*Contd.*
P.M. 8.35	Received S.G.: "Here is the forecast: 'Colder, unsettled, some snow or sleet. Easterly and NE'ly winds, increasing in force.'"
10.0	Sent S.G.: "Crawford to Gott." "About to make final. Weather promising. Will see Mr. Wilmot to-morrow for tests and your instructions. Compliments of the Season from all."
10.7	Sent S.G.: "'Silvergray, London', and Gray, Lessness Park, Abbey Wood, Kent." "Thursday, 10 p.m. About to make final splice. Will see Waterville *re* tests and instructions. All well. Compliments of Season from all.—Crawford, 'Buccaneer.'"
11.35	"Crawford to Wilmot." "Now about to make final splice. Please advise Weston to call you at 3 a.m. We will see you to-morrow. Compliments of the Season from all."
	"Wilmot to Crawford." "Thanks, I cordially wish you all the same."
11.35	Gave out both ends for splice. No indicated length taken as cable paid out through stoppers.
MID.	Light variable airs. Fine and overcast. Bar. 30·18. Ther. 56° F.
	FRIDAY, DECEMBER 25th (14th DAY OUT).
A.M. 0.30	Commenced joints.
2.30	Finished ,,
2.40	Commenced splice.
3.15	Sounded No 2^{T}—10 fms. Air Temp., 51° F. Bot., 49½° F. S.S., 52° F.
4.0	Finished splice. Light NE airs and fine. Bar. 30·17. Ther. 52° F.
4.5	Commenced paying out final splice by hanging ropes.

HOUR.

FRIDAY, DEC. 25th (14th DAY OUT).—*Contd.*

A.M.

4.17 Cut hanging ropes and slipped final splice, thus completing the Repair to the Commercial Cable Co.'s Weston—Waterville No. 1 Cable.

Position { Lohar R.C. Church } 60° 30′
Old Watch Tower
Western Pig Rock } 39° 00′

By horizontal angles. Sounding = 12½ fms.

Total Cable Expended.	Laid in Section.
Type 8567 = 0·1150 N.M.	Type 8567 = 0·1080 N.M. (5 fms. splice.)
,, 8556 = 0·1245 ,,	,, 8556 = 0·1185 ,,
Total = 0·2395 ,,	Total = 0·2265 ,,

Cut out of Section.

Shore End type = 0·150 N.M.	Laid in = 0·2265 N.M.
Cut off Weston End for Splice = ·004 ,,	Cut out = 0·1540 ,,
·154 ,,	0·0725 ,, Increase

4.20 Set on to dodge till daylight.

8.0 Light NNE breeze. Fine.
Bar. 30·17. Ther. 52° F.

8.30 Picked up balloon buoys put down for marks on Sunday last.

8.40 Picked up Mark Buoy "B."

10.7 Messrs. Crawford and Cann left for shore to get result of final tests, and instructions.

NOON. Calm and fine weather.
Bar. 30·17. Ther. 53° F.

P.M.

0.3 Messrs. Crawford and Cann returned to ship. Set on for London.

0.35 Pilot O'Neill left ship off Horse Island.

1.55 Bull Island abeam.

HOUR.	FRIDAY, DEC. 25th (14th DAY OUT)—*Contd.*
P.M.	
3.46	Mizen Head abeam
4.0	Light ESE airs and calm sea. Fine and clear. Bar. 30·19. Ther. 52° F.
4.38	Fastnet abeam.
8.0	Mod. variable breeze and fine. WSW swell. Bar. 30·14. Ther. 48° F.
MID.	Light ENE wind and fine. Bar. 30·08. Ther. 44° F.

STEAMING TO LONDON.

SATURDAY, DECEMBER 26th (15th DAY OUT).

A.M.	
4.0	Light N'ly airs and fine. Bar. 30·03. Ther. 46° F.
8.0	Mod. NE wind and cloudy. Passing hail and sleet. Bar. 30·00. Ther. 50° F.
8.22	Longships Lighthouse abeam.
10.34	Lizard Lighthouse abeam. Signalled Lizard Ship's Number.
NOON.	Mod. ENE wind. Fine and cloudy. Bar. 29·94. Ther. 48° F.
P.M.	
4.0	Fresh ENE breeze and fine. Cloudy. Bar. 29·97. Ther. 50° F.
4.55	Start Point Light abeam.
8.0	Fresh E wind and squally, with head sea. Hail and rain. Bar. 30·03. Ther. 49° F.
MID.	Fresh E wind and squally, with rain and hail. Bar. 30·33. Ther. 54° F.

SUNDAY, DECEMBER 27th (16th DAY OUT).

A.M.	
2.38	St. Catherine's Light abeam.
4.0	Fresh E × N breeze. Passing clouds, but clear. Bar. 30·02. Ther. 54° F.

HOUR.	SUNDAY, DEC. 27th (16th DAY OUT).—*Contd.*
A.M. 8.0	Strong E wind and overcast. Bar. 30·08. Ther. 52° F.
9.15	Beachy Head abeam.
10.2	Royal Sovereign Light Vessel abeam.
NOON.	Strong E wind and overcast. Bar. 30·08. Ther. 45° F.
P.M. 0.25	Picked up Pilot, Mr. E. Bussey, off Dungeness and proceeded.
2.33	Signalled at Dover.
3.58	Gull Buoy abeam.
4.0	Fresh E breeze. Cloudy and fine. Bar. 30·17. Ther. 50° F.
8.0	Mod. breeze (NNE). Overcast and showery. Bar. 30·07. Ther. 50° F.
8.20	Brought up off Mucking Light with starboard anchor.
MID.	Light NNE breeze. Passing rain and hail showers. Bar. 30·08. Ther. 53° F.

STEAMING UP RIVER.

MONDAY, DECEMBER 28th (17th DAY OUT).

A.M. 4.0	Light N wind and overcast. Passing hail and rain squalls. Bar. 30·10. Ther. 50° F. Hove up anchor and proceeded up river.
4.50	Off Gravesend.
5.20	Pilot Twist having not boarded, decided to anchor.
5.40	Let go starboard anchor.
8.0	Light N wind and overcast. Bar. 30·12. Ther. 49° F.
8.45	Pilot Twist boarded. Pilot Bussey left. Ship too late for A.M. tide.

HOUR.	MONDAY, DEC. 28th (17th DAY OUT).—*Contd.*
A.M. 9.20	Messrs. Crawford, Cann, and Walker left ship.
NOON.	Light N wind, with sleet at times.
P.M. 1.20	Hove up anchor and proceeded up river towards the Royal Albert Docks.
2.54	Anchored of Dock gates.
3.51	Hove up anchor.
4.0	Light N wind. Fine and overcast. Bar. 30·15. Ther. 49° F.
4.7	Entered Lock.
5.0	Entered Victoria Dock.
6.35	Entered berth to await for Dry Dock.
8.0	Light N wind. Fine and cloudy.
	Draught of Ship $\left\{\begin{matrix}\text{Fore}=10'\ 2'' \\ \text{Aft}=13'\ 0''\end{matrix}\right\}$ Mean $=11'\ 7''$.
	TUESDAY, DECEMBER 29th.
2.0	All hands paid off and discharged.

DISTRIBUTION OF CABLE IN SHIP ON ARRIVAL IN LONDON, DECEMBER 28TH, 1903.

AFTER TANK.

Type.	Factory No.	Length. N.M.	Weight. Tons.
S.E.	8556	1·535	18·42
Main	8512	4·951	10·77
Int.	8514	1·643	9·08
		8·129 =	38·27

FORE TANK.

Type,	Factory No.	Length. N.M.	Weight. Tons.
* Piece "A"	8567	0·150	2·85
Main	8552	3·006	8·92
Int.	8553	1·108	3·79
		4·264 =	15·56

SUMMARY.

After Tank	8·129 N.M.	= 38·27	Tons.
Fore Tank	4·264 „	= 15·56	„
TOTAL	12·393 „	= 53·83	„

* Picked up cable, mechanically bad and electrically weak.

COMMERCIAL CABLE COMPANY'S

WESTON—WATERVILLE No. 1 CABLE REPAIR.

S.S. "BUCCANEER," DECEMBER, 1903.

DISTRIBUTION OF WEIGHT IN SHIP ON ARRIVAL IN LONDON.

	Tons.
Cable in fore tank	12·71
,, after ,, ...	38·27
Coal in bunkers	75·00
Fresh water in after fresh water tank	6·00
,, ,, fore cone	—
,, ,, side tanks	4·50
Water in ballast tank—forward	—
,, ,, aft	70·00
Boatswain's stores	·50
Cable stores and buoys	11·50
Engine room stores	2·25
Water in main boilers	30·00
Steward's stores	2·00
Extra chain cable	1·00
Spare anchors, ropes, etc.	2·00
,, propeller	3·00
Deck machinery	10·00
Total ...	268·73 tons

Draught of ship on arrival { Fore = 10′ 2″ / Aft = 13′ 0″ } Mean = 11′ 7″

WESTON—WATERVILLE No. 1 CABLE REPAIR.

S.S. "BUCCANEER."

ELECTRICAL REPORT.

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ELECTRICAL REPORT.

F. C. Crawford, Esq.,
Engineer in Charge.
S.S. "Buccaneer."

December 31st, 1903.

Dear Sir,

On December 9th the S.S. "Buccaneer" was chartered by the Commercial Cable Company for the purpose of removing a fault in the Weston No. 1 Cable (twin core), both cores being faulty at the same place. The fault had been localised by Loop test from Weston, and its position placed at 20^{ω} from Waterville Office. This resistance —at the sea temperature—represented a *cable* distance of 1·57 n.m from Waterville Office, or 1·25 n.m. from H.—W. mark, Waterville Beach. On the 11th inst. Weston reported no continuity on both cores.

After shipping cable from Silvertown Works, and two lengths of cable *ex* barge "Wilts," from Siemens' Bros., viz., 0·115 n.m. of Type 8567, and 1·660 n.m. of Type 8556—see Loading Table—the S.S. "Buccaneer" left her moorings off Silvertown, on December 12th, 7.45 a.m., and after adjusting compasses at Greenhithe, cast off from buoys at 1.36 p.m. same afternoon, and proceeded for Waterville. After a very rough passage, having to shelter *en route* at the Nore, Isle of Wight, and Falmouth, the ship arrived off Horse Island, Ballinskelligs Bay, at 9 am., December 18th, where Pilot O'Neill boarded, and owing to the heavy weather prevailing, proceeded to Valencia Harbour for shelter, anchoring there at 11 a.m. same morning.

Note.—While in Falmouth Harbour the opportunity was taken to cover the cable in both tanks with water, and all sections of cable

were tested. The results were quite satisfactory, with the exception of spliced section, Type 8512, length = 4·95 N.M. This cable showed a weakness, the electrification readings being irregular with both currents, and after the application of 450 volts the D.R. per N.M. decreased from over 700 Ω per N.M. to 200 Ω approx.

Shortly after anchoring at Valencia, Messrs. Crawford, Cann, and Captain Combe proceeded by car to Waterville to interview Mr. Wilmot *re* work in hand, and to receive any further instructions. Mr. Cann also arranged with Mr. Wilmot—having regard to the long length in circuit on the Weston side—to work Mirror with Weston, using two to three cells only.

The following morning (19th inst.), the wind having abated, weighed anchor and proceeded for Waterville. Placed Mark Buoy, and angles were taken to determine position of cable. Anchored for the night at 4.15 p.m. in Ballinskelligs Bay. The next day—Dec. 20th, 8.40 a.m.—lowered grapnel for Drag No. 1, and hooked cable, which on being brought to the surface was taken to be the Harve—Waterville Section. This cable was slipped without damage —its position being marked by a balloon buoy—and grappling resumed. Hooked same cable, which was again slipped and position marked. Drags 3 and 4 were unsuccessful, but Drag 5 hooked a cable (1.17 p.m.) which was taken to be the "Southern." Slipped cable and resumed dragging.

NOTE.—Mr. Wilmot, Superintendent at Waterville Station, joined ship at noon, having come off to ship in coastguard's boat.

At 2.45 p.m. hooked the Weston No. 1 Cable, and at 3.51 p.m. the Waterville end was handed to Testing Room. Waterville was called without success, and tests were then taken by Cann's method, and the fault found to be a short distance from the ship. Waterville end was then buoyed (4.30), and Weston end hove in for testing. On calling Weston very strong signals were received which were quite unreadable, being off scale with 1 ω shunt and brash inserted. Weston was requested to decrease battery, and as darkness was

approaching, and wind and sea increasing, it became imperative to buoy end immediately. Weston end was accordingly buoyed at 4.56 p.m., and the ship anchored off Rinneen Point at 5.10 p.m. During the night the wind increased, and next morning a strong SE gale was blowing. At daylight weighed anchor, and ran for Valencia, anchoring there at 11.35 a.m.

The "Buccaneer" remained in Valencia Dec. 22nd and 23rd, a SSW gale prevailing. The weather having moderated on Dec. 24th, hove up anchor (8.3 a.m.) and proceeded to cableground, arriving alongside buoy on Weston end at 10.20 a.m. Weston end was raised, and on calling up at 10.35 a.m., ship received an immediate answer to call, Weston signals being good with an unshunted galvanometer.

Ship now took a series of tests on Weston end.

CONDUCTOR RESISTANCE. (Cores looped at Weston.)

Length in circuit = 328·796 N.M.

C.R. of loop (corrected) = $8353{\cdot}4\,\omega$ = { Plain core = $4174{\cdot}3\,\omega$. Rib ,, = $4179{\cdot}1\,\omega$.

Calculated temperature by C. F. & T.'s co-efficient = 52°·2 F.

DIELECTRIC RESISTANCE. (30 volts.)

Plain core, 1′, Z., abs. = $20{\cdot}09\,\Omega = 6606\cdot\,\Omega$ per N.M. at sea temp.

Rib ,, ,. = $18{\cdot}834\,\Omega = 6195\cdot\,\Omega$,, ,, ,,

INDUCTIVE CAPACITY. *Kelvin's Null Method.* (30 volts.)

Plain core = 100·77 mfds. Total.

Rib ,, = 99·69 ,, ,,

At 11.23 a.m. sent S.G.—"Cann to S. W. N. One hour after we buoy your end, please take insulation and capacity of buoyed cable, and send results to Waterville," and at 11.50 a.m. buoyed Weston end.

At 11.55 a.m. ship was up to buoy on Waterville end, and at 0.20 p.m. commenced picking up to fault. At 0.45 p.m., a bad place

came inboard with many broken wires. On examination found both cores parted, with conductor exposed. Cut cable forward of bad place, called Waterville on Morse and received immediate reply. Instructed Waterville to "free" both cores, and ship tested for D.R. Both cores found to be "O.K." Deflection nil. S.R. 10000. Testing battery = 30 volts.

Length of cable picked up to fault = 0·150 N.M. Type 8567. Coiled in fore tank and labelled Piece "A." Mechanically bad and electrically weak.

NATURE OF FAULT.

Damaged portion about three feet. Sheathing holding by seven *inner* wires and two complete strands of *outer* and one single wire. The rest of the wires chafed through by rock. *Core exposures.*—Waterville end both cores scarfed, about $\frac{1}{4}''$ of conductor exposed. On Weston end the scarf was about $\frac{1}{2}''$ with similar exposure.

1.25 p.m. Ship took C.R. ON WATERVILLE END. Cores looped on shore.

C.R. of loop (corrected) = $45\overset{\omega}{\cdot}091$. 75° values { Plain core = $23\overset{\omega}{\cdot}94$. Rib ,, = $23\overset{\omega}{\cdot}87$.

Plain core = $22\overset{\omega}{\cdot}580$. Rib core = $22\overset{\omega}{\cdot}511$.

Calculated temperature by C. F. & T.'s co-efficient = 48·8° F.

At 1.32 p.m., after testing spliced section in after tank 8567 + 8556 for C.R., I.C., and D.R., the tank cable and Waterville end were given out to prepare for splicing, and at 3.15 p.m. the following S.G.'s were despatched:

"To Gott. Cut out fault in Weston No. 1, $22\overset{\omega}{\cdot}5$ from Waterville. Fault was bad, chafe close to a splice. Have removed 150 fathoms. Cable on both sides in good condition. Hope to put through by to-morrow daylight. Please instruct. Crawford, 'Buccaneer.'"

"'Silvergray' and 'Graysilver, London.'

"Cut out fault off Waterville, and hope to put through to-morrow morning. All well. Crawford, 'Buccaneer.'"

3.30 p.m. Joints between tank cable and Waterville end commenced.

5.30 p.m. Joints between tank cable and Waterville end finished.

Joints brass taped. Jointer, Molt.

Received Weston's tests on buoyed end from Waterville.

WESTON'S TESTS ON BUOYED END.

Length in circuit = 328·796 N.M. (each core.)

Plain core.	Zinc mean of 5 minutes			= 22·04 Ω	abs.
,, ,,	Carbon	,,	,,	= 26·34	,,
Rib ,,	Zinc	,,	,,	= 20·37	,,
,, ,,	Carbon	,,	,,	= 22·04	,,
Non-Earth.	Zinc to Rib	,,	,,	= 20·21	,,
,, ,,	,, Plain		,,	= 21·39	,,

CAPACITY.

Rib core = 101·78 mfds.
Plain ,, = 102·90 ,,

7.10 p.m. (Dec. 24th.) Splice between tank cable and Waterville end completed. Splice compounded. 5 fms. = 0·005 N.M. cut off tank cable 8567 for splice.

At 7.20 p.m. the following S.G. was received from Waterville:

"To Crawford, 'Buccanner.' Better put in ship's new shore end. Gott."

Commenced paying out cable towards Weston buoy, at 7.25 p.m., reaching same at 7.40 p.m. Control test applied during paying out.

The following S.G.'s were now sent:

7.30 p.m. "Crawford to Gott. Just received yours. Now coming up to Weston end, paying out Nos. 8567 and 8556. I take this is what you wish."

8.10 p.m. "Crawford to Wilmot. After slipping final splice will proceed to sea for night, returning to pick up buoys at daylight, and

if weather favourable will land, otherwise proceed to Valencia and drive over for tests. Weston end now on board. Please send to-day's weather report."

At 8.30 p.m., Weston was called, and ship tested for D.R., the results being "O.K."—practically the same as on picking up the end this morning. Weston was now instructed to take C.R., the cores being looped on board.

WESTON'S C.R. $= 8378\overset{\omega}{\cdot}$ (loop).

Ship took C.R. on Weston side. (Cores looped at Weston.)

Total C.R. of loop (corrected) $= 8350\overset{\omega}{\cdot}$

At 9.36 p.m. advised Weston: "About to cut and make final splice. Call Waterville at 1 a.m. to-morrow morning. Anything further for you will advise from Waterville. Compliments of the Season. G.B."

9.40 p.m. Closed with Weston, and gave out end for opening out for splice.

At 10 p.m., the following S.G.'s were sent from ship to Waterville:

"Crawford to Gott. 10 p.m. About to make final splice. Weather promising. Will see Mr. Wilmot to-morrow for tests and your instructious."

"To 'Silvergray, London,' and Mr. M. H. Gray, Lessness Park, Abbey Wood, Kent. Thursday, 10 p.m. About to make final splice. Will see Waterville to-morrow *re* tests and instructions. All well. Compliments of Season from all. Crawford, 'Buccaneer.'"

At 10.15 p.m. the cable was cut in tank.

LENGTH PAID OUT BY C.R. AND I.C. $= 0{\cdot}2265$ N.M. Types 8567 and 8556.

Laid in between buoys $\left\{\begin{matrix}\text{Type } 8567 = 0{\cdot}1080 \text{ N.M.} \\ \text{,, } 8556 = 0{\cdot}1185 \text{ ,,}\end{matrix}\right\} = 0{\cdot}2265$ N.M.

Waterville was now instructed to take C.R. of cable between ship and shore, the cores being looped on board.

C.R. of Loop (corrected) = 51·07 ω*

At 10.50 p.m. (Dec. 24th), ship having "freed" both cores on board, Waterville took D.R. tests on Plain and Rib Cores with following result:

Waterville D.R. Test on Cable between Ship and Shore.

Plain Core, mean Z. and C. = 466· Ω abs.
Rib ,, ,, ,, = 325· ,,

Length in circuit = { 1·7935 N.M. Cable.
0·2210 ,, L.L.

2·0145

N.B.—This result being too low, Waterville was instructed to test again, the result obtained being practically the same. Waterville then "freed" cores, and ship took a D.R. test. With 30 volts and S.R. 10000 × power = 1, the deflection on cable was inappreciable. The current was kept on for six minutes and no change noticed. It was therefore decided under the circumstances to splice up. The following morning, in conversation *re* this subject, Mr. Wilmot informed Mr. Cann that he thought a weakness existed in the cable buried ashore.

At 11.31 p.m., sent following S.G. to Waterville:

"Crawford to Wilmot. Now about to make final splice. Please advise Weston to call you at 3 a.m. We will see you to-morrow. Compliments of the Season from all."

Closed with Waterville at 11.38 p.m., and gave out both ends for splicing.

* Deducting 5·7 ω, the C.R. of length (looped core) laid in *ex* after tank. This resistance becomes 51·07 ω—5·7 ω = 45·37 ω = C.R. of looped cores up to "Buccaneer's" first splice. Ship obtained a C.R. of 45·09 ω, a difference thus existing of 0·28 ω, which, at 25·251 ω—the resistance per N.M. of looped cores at 49° F.—represents a length = 0·011 N.M.—say, 11 fms. only.

Christmas Day, Dec. 25th.

0.30 a.m. Commenced joints between Weston and Waterville ends.

2.30 a.m. Finished joints between Weston and Waterville ends. Brass taped.

N.B.—Both cores of 8556 spliced on to Weston end are Plain. They had previously been marked on board Nos. 1 and 2, and when jointing cores for final splice, No. 1 was joined to Plain, and No. 2 to Rib core of Weston end. This order of joining up has always been followed on previous repairs.

4 a.m. Finished splice. Compounded over all, and at 4.17 a.m. slipped same, thus completing repairs to the Commercial Cable Company's Weston No. 1 Section, and set on to cruise until daylight.

8.30 to 8.40 a.m. Picked up balloon buoys and mark buoy.

Shortly after 10 a.m. Messrs. Crawford and Cann left ship for shore for instructions, and to receive results of tests taken on Weston No. 1 Cable after repair. On arriving at the Station (Waterville) Mr. Wilmot handed to Mr. Cann the following results of tests:

Weston No. 1.	Tests after Repair.
	Ω
Plain Core ...	... Z = 12690· per N.M.
,, ,, ...	... C = 7720· ,,
Rib ,, ...	... Z = 12270· ,,
,, ,, ...	... C = 7430· ,,
Non-Earth ...	Z to P = 8660· ,,
,, ,, ...	C to P = 8870· ,,

Messrs. Crawford and Cann returned to ship at noon, and having discharged Pilot O'Neill off Horse Island, the "Buccaneer" set on for London, arriving off Gravesend at 6 a.m., Dec. 28th.

In the Appendix will be found the following tables, etc.:

Revised Length and 75° F. Values of Plain and Rib Cores after Repair.

Distribution of Cable in Tanks, and 75° F. Values on Leaving the Thames.

Distribution of Cable in Tanks, and 75° F. Values on Return to the Thames.

Expenditure Table.

Diagram Sheet of Repairs, containing Tests, etc., etc.

I am, dear Sir,

Yours faithfully,

HERBERT E. CANN.

Electrician.

Cover Sheet.

WESTON No. 1 CABLE,

After repairs by S.S. "Buccaneer."

December, 1903.

ELECTRICAL VALUES AT 75° F.

PLAIN CORE.

Sheet.	Length N.M.	Total C.R. ω	Total I.C. Mfds.
A	27·360	365·896	8·444
B	67·850	915·32	20·733
C	210·364	2800·53	63·471
D	25·011	334·13	7·661
Totals	330·585	4415·876	100 309

RIB CORE.

Sheet.	Length N.M.	Total C.R. ω	Total I.C. Mfds.
A	27·360	367·770	8·308
B	67·850	916·76	20·518
C	210·364	2802·43	62·678
D	25·011	333·65	7·466
Totals	330·585	4420·61	98·970

Ship.	Date.	Type.	Sheathing.	Core.	Lengths.		C.R. at 75° F.			Capacity.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
					Nauts.	Nauts.	Ohms.	Ohms.	Ohms.	Mfds.	Mfds.	Mfds.	° F.	Fms.		
Original ..	1885	8554	12/·220	90/85	·5		13·566	6·782		·309	·1545				1	
„ ..	„	8557	20/·100 10x3/·200	„	1·0	1·500	„	13·566	20·348	„	·309				2	
„ ..	„	8556	20/·100 12/·300	„	·85	2·350	„	11·530	31·878	„	·2626				3	
"Bittern" ..	19.12.95	8555	12/·280	„	1·157	3·507	„	15·695	47·573	„	·3575				4	
Original ..	1885	8556	20/·100 12/·300	„	·329	3·836	„	4·463	52·036	„	·1016	1·185			5	
„ ..	„	„	„	„	14·270	18·105	13·372	190·800	242·836	·3043	4·342	5·527			6	
"Marmion" ..	1.2.01	„	„	„	1·02	19·126	13·345	13·610	256·44	·3030	·309	5·836			7	
„ ..	„	8555	12/·280	„	·67	19·796	13·361	8·950	265·39	„	·203	6·039			8	
„ ..	„	„	„	„	3·59	23·386	13·28	47·670	313·03	„	1·202	7·241			9	
Original ..	1885	„	„	„	1·107	24·493	13·371	14·800	327·86	·3035	·336	7·577			10	
"Mirror," new	24.11.99	8553	15/·143	„	1·087	25·580	13·12	14 260	342·12	·3026	·329	7·906	53	17-19	11	
„ relaid	„	8555	12/·280	„	1·123	26·703	13·357	15·000	357·12	·3028	·340	8·246	„	„	12	
„ „	„	„	„	„	·216	26·919	„	2·880	360·00	·301	·065	8·311	„	„	13	
„ „	„	„	„	„	·143	27·062	„	1·910	361·91	·3007	·043	8·354	„	„	14	
„ „	„	„	„	„	·07	27·132	„	·935	362·851	·3000	·021	8·375	„	„	15	
„ „	„	„	„	„	·228	27·360	„	3·045	365·896	·3026	·069	8·444	„	„	16	

C.R. IS HERE GIVEN OF THE CABLE LENGTH—NOT CORE LENGTH.

Ship.	Date.	Type.	Sheathing.	Core.	Lengths.		C.R. at 75° F.			Capacity.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
					Nauts.	Nauts.	Ohms.	Ohms.	Ohms.	Mfds.	Mfds.	Mfds.	° F.	Fms.		
Original	1885	8555	12/·280	90/85	5·117		13·45	68·82		·3043	1·557				1	
"Mirror," new ..	12.6.98	„	„	„	·449	5·566	13·532	6·075	74·895	·3034	·138	1·695			2	
Original	1885	„	„	„	·234	5·800	„	3·116	78·061	·3044	·071	1·766			3	
"Mackay Bennett"	6.3.90	8524	12/·230	70/75	1·560	7 360	17·51	27·32	105·381	·3192	·498	2·264			4	
"Mirror," relaid ..	17.9.99	8555	12/·280	95/85	1·247	8 607	13·34	16·63	122·01	·3023	·377	2·641	65	30-32	5	
„ new ..	„	„	„	„	·285	8·892	13·545	3·86	125·87	·3052	·087	2·728			6	
„ „ ..	„	8553	15/·143	„	·629	9 521	13·53	8·51	134·38	·3084	·194	2·922			7	
Original	1885	8555	12/·280	„	12·116	21·637	13·352	161·78	296·16	·3034	3·666	6·588			8	
„	„	8554	12/·230	„	41·500	63·137	13·416	556·67	852·83	„	12 580	19·168			9	
„	„	8553	15/·143	„	·650	63·787	„	8·72	861·55	·3046	·198	19·366			10	
„	„	„	„	„	·135	63·922	13 33	1·80	863·35	„	·041	19·407			11	
"Buccaneer" ..	Jan., '02	„	„	„	2·595	66·517	13·275	34·44	897·79	·3341	·867	20·274	49·2		12	
Original	1885	„	„	„	·123	66·640	13·223	1·63	899·42	·2927	·036	20·310			13	
"Lapwing"	Dec., '02	„	„	„	1·210	67·850	13·134	15·90	915·32	·3562	·423	20·733		40	14	

Ship.	Date.	Type.	Sheathing.	Core.	Lengths.		C.R. at 75° F.			Capacity.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
					Nauts.	Nauts.	Ohms.	Ohms.	Ohms.	Mfds.	Mfds.	Mfds.	° F.	Fms.		
Original	1885	8553	15/·143	90/85	23·219		13·223	307·0		·3001	6·968				1	
„	„	8552	17/·124	„	59·689	82·908	13·32	795·0	1102·0	„	17·913	24·881			2	
"Buccaneer" ..	24.7.02	8553	15/·143	„	·277	83·185	13·36	3·7	1105·7	·3033	·084	24·965			3	
„	„	„	„	„	·75	83·935	„	10·02	1115·72	„	·227	25·192			4	
„	„	„	„	„	·063	83·998	„	·85	1116·57	„	·019	25·211			5	
„	„	„	„	„	·437	84·435	„	5·86	1122·43	·3043	·133	25·344			6	
„	„	„	„	„	·827	85·262	„	11·05	1133·48	·3023	·250	25·594			7	
„	„	„	„	„	·906	86·168	„	12 03	1145·51	·3344	·303	25·897			8	
Original	1885	8552	17/·124	„	32·196	118·364	13·32	428·70	1574·21	·3046	9·806	35·703			9	
„	„	8551	„	„	86·0	204·364	13·337	1147·00	2721·21	·3019	25·960	61·663			10	
„	„	8552	17/·124	„	6·0	210·364	13·22	79·32	2800·53	·3013	1·808	63·471			11	

Ship.	Date.	Type.	Sheathing.	Core.	Lengths.		C.R. at 75° F.			Capacity.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
					Nauts.	Nauts.	Ohms.	Ohms.	Ohms.	Mfds.	Mfds.	Mfds.	° F.	Fms.		
Original	1885	8554	12/·220	90/85	4·68		13·22	1·87		·3013	1·410		50	54	1	
"Buccaneer" ..	16.6.01	8553	15/·143	"	·348	5·028	13·25	4·61	66·48	·3304	·116	1·527	48	53	2	
Original	1885	8555	12/·280	"	9·825	14·853	13·4	131·65	198·13	·3062	3·008	4·535			3	
"	"	8566	20/·100 12/·360	"	1·827	16·680	"	24·48	222·61	"	·559	5·094			4	
"Marmion" ..	5.2 01	"	"	"	·340	17·020	13·18	4·48	227·09	·333	·113	5·207	48		5	
Original	1885	"	"	"	5·912	22·932	13·4	79·22	306·31	·3062	1·810	7·017	48		6	
"	"	8567	20/·100 10x3/·220	"	·286	23·218	"	3·83	310·14	"	·088	7·105			7	
"Buccaneer" ..	24.12.03	8556	20/·100 12/·300	"	·1185	23·336	"	1·59	311·73	·351	·042	7·147	48½		8	
" ..	"	8567	20/·100 12x3/·220	"	·108	23·444	13·10	1·41	313·14	·333	·036	7·183	49½ (?)		9	
Original	1885	"	20/·100 10x3/·220	"	·260	23·704	13·4	3·48	316·62	·3062	·080	7·263			10	
"	"	"	"	"	·247	23·951	"	3·31	319·93	"	·075	7·338			11	
"Grebe"	2.12.99	"	"	"	·130	24·081	"	1·74	321·67	"	·039	7·377			12	
Original	1885	"	"	"	·920	25·001	"	12·33	334·00	"	·281	7·658			13	
"	"	Beach	"	"	·010	25·011	"	·13	334·13	"	·003	7·661			14	
Original U.G. ..	"	8558	21/·100	90/85 4 cores.	·221		13·35	2·95			·067					

Ship.	Date.	Type.	Sheathing.	Core.	Lengths.		C.R. at 75° F.			Capacity.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
					Nauts.	Nauts.	Ohms.	Ohms.	Ohms.	Mfds.	Mfds.	Mfds.	° F.	Fms.		
Original ..	1885	8554	$^{12}/_{\cdot220}$	$^{90}/_{85}$	0·5		13·54	6·77		·3041	·152				1	
„ ..	„	8557	$^{20}/_{\cdot100}$ $^{10x3}/_{\cdot200}$	„	1·0	1·5	„	13·54	20·31	„	·304	·456			2	
„ ..	„	8556	$^{20}/_{\cdot100}$ $^{12}/_{\cdot300}$	„	·85	2·35	„	11·52	31·83	„	·258	·714			3	
"Bittern" ..	19.12.95	8555	$^{12}/_{\cdot280}$	„	1·157	3·507	„	16·67	48·50	„	·351	1·065			4	
Original ..	1885	8556	$^{20}/_{\cdot100}$ $^{12}/_{\cdot300}$	„	·329	3·836	„	4·44	52·94	„	·100	1·165			5	
„ ..	„	„	„	„	14·27	18·106	13·386	191·80	244·74	·2977	4·248	5·413			6	
"Marmion" ..	1.2.01	„	„	„	1·02	19·126	13·373	13·64	258·38	·2970	·303	5·716			7	
„ ..	„	8555	$^{12}/_{\cdot280}$	„	·67	19·796	„	8·96	267·34	„	·199	5·915			8	
„ ..	„	„	„	„	3·59	23·386	13·268	47·63	314·97	·3348	1·202	7·117			9	
Original ..	1885	„	„	„	1·107	24·493	13·37	14·80	329·77	·2972	·329	7·446			10	
"Mirror," new	24.11.99	8553	$^{15}/_{\cdot143}$	„	1·087	25·580	13·1	14·24	344·01	·3082	·335	7·781	53	17-19	11	
„ relaid	„	8555	$^{12}/_{\cdot280}$	„	1·123	26·703	13·35	14·99	359·00	·2961	·333	8·114	„	„	12	
„ „	„	„	„	„	·216	26·919	„	2·883	361·883	„	·064	8·178	„	„	13	
„ „	„	„	„	„	·143	27·062	„	1·909	363·792	„	·042	8·220	„	„	14	
„ „	„	„	„	„	·070	27·132	„	·935	364·727	„	·021	8·241	„	„	15	
„ „	„	„	„	„	·228	27·360	„	3·043	367·770	„	·067	8·308	„	„	16	

C.R. IS HERE GIVEN OF THE CABLE LENGTH—NOT CORE LENGTH.

Ship.	Date.	Type.	Sheathing.	Core.	Lengths.		C.R. at 75° F.			Capacity.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
					Nauts.	Nauts.	Ohms.	Ohms.	Ohms.	Mfds.	Mfds.	Mfds.	° F.	Fms.		
Original	1885	8555	12/·280	90/85	5·117		13·422	68·68		·2974	1·522				1	
"Mirror," new ..	12.6.98	„	„	„	·449	5·566	„	6·02	74·70	„	·133	1·655			2	
Original	1885	„	„	„	·234	5·800	„	3·14	77·84	„	·070	1·725			3	
"Mackay Bennett"	6.3.90	8524	12/·230	70/75	1·560	7·360	17·514	27·32	105·16	·3193	·498	2·223			4	
"Mirror," relaid ..	17.9.99	8555	12/·280	90/85	1·247	8·607	13·50	16·83	121·99	·2959	·369	2·592	65	30-32	5	
„ new ..	„	„	„	„	·285	8·892	13·44	3·85	125·84	·3018	·086	2·678	„		6	
„ „ ..	„	8553	15/·143	„	·629	9·521	13·50	8·49	134·33	·3036	·191	2·869	„		7	
Original	1885	8555	12/·280	„	12·116	21·637	13·43	162·70	297·03	·300	3·634	6·503			8	
„	„	8554	12/·230	„	41·500	63·137	13·43	557·40	854·43	„	12·45	18·953			9	
„	„	8553	15/·143	„	·650	63·787	13·445	8·74	863·17	„	·195	19·148			10	
„	„	„	„	„	·135	63·922	13·335	1·80	864·97	·2963	·04	19·188			11	
"Buccaneer" ..	Jan., '02	„	„	„	2·595	66·517	13·285	34·47	899·44	·3326	·863	20·051	49·2		12	
Original	1885	„	„	„	·123	66·640	13·30	1·64	901·08	·29626	·036	20·087			13	
"Lapwing"	Dec., '02	„	„	„	1·210	67·850	12·96	15·68	916·76	·3562	·431	20·518		40	14	

Ship.	Date.	Type.	Sheathing.	Core.	Lengths.		C.R. at 75° F.			Capacity.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
					Nauts.	Nauts.	Ohms.	Ohms.	Ohms.	Mfds.	Mfds.	Mfds.	° F.	Fms.		
Original	1885	8553	15/·143	90/85	23·219		13·30	308·80		·29626	6·878				1	
„	„	8552	17/·124	„	59·689	82·908	13·29	793·20	1102·00	·29565	17·646	24·524			2	
"Buccaneer" ..	24.7.02	8553	15/·143	„	·277	83·185	13·43	3·72	1105·72	·2986	·083	24·607			3	
„	„	„	„	„	·75	83·935	13·41	10·06	1115·78	„	·224	24·831			4	
„	„	„	„	„	·063	83·998	13·49	·85	1116·63	„	·019	24·850			5	
„	„	„	„	„	·437	84·435	13·45	5·88	1122·51	·2997	·131	24·981			6	
„	„	„	„	„	·827	85·262	13·42	11·10	1133·61	„	·247	25·228			7	
„	„	„	„	„	·906	86·168	13·29	12.04	1145·65	„	·301	25·529			8	
Original	1885	8552	17/·124	„	32·196	118·364	13·368	430.40	1576·05	·3037	9·777	35·306			9	
„	„	8551	„	„	86·000	204·364	13·338	1147·00	2723·05	·29752	25·590	60·896			10	
.. ..	„	8552	17/·124	„	6·000	210·364	13·23	79.38	2802·43	·2967	1·782	62·678			11	

Ship.	Date.	Type.	Sheathing.	Core.	Lengths.		C.R. at 75° F.			Capacity.			Approximate Bottom Temperature.	Depth.	Reference Numbers.	Remarks.
					Each Piece.	Totals.	Per N.M.	Absolute.	Totals.	Per N.M.	Absolute.	Totals.				
					Nauts.	Nauts.	Ohms.	Ohms.	Ohms.	Mfds.	Mfds.	Mfds.	° F.	Fms.		
Original	1885	8554	12/·220	90/85	4·68		13·23	61·91		·2967	1·389				1	
"Buccaneer" ..	16.6.01	8553	15/·143	„	·348	5·028	13·25	4·61	66·52	·3333	·116	1·505	48	53	2	
Original	1885	8555	12/·280	„	9·825	14·853	13·382	131·50	198·02	·29764	2·924	4·420			3	
„	„	8566	20/·100 12/·360	„	1·827	16·680	„	24·44	222·46	„	·543	4·972			4	
"Marmion" ..	5.2.01	„	„	„	·340	17·020	13·18	4·48	226·94	„	·113	5·085	48		5	
Original	1885	„	„	„	5·912	22·932	13·358	78·97	305·91	·2972	1·757	6·842			6	
„	„	8567	20/·100 10x3/·220	„	·286	23·218	„	3·82	309·73	„	·085	6·927			7	
"Buccaneer" ..	24.12.03	8556	20/·100 12/·300	„	·1185	23·336	13·32	1·58	311·31	·343	·041	6·968	48½	11½	8	
„ ..	„	8567	20/·100 12x3/·220	„	·108	23·444	13·15	1·42	312·73	·311	·034	7·002	49½ (?)	10	9	
Original	1885	„	20/·100 10x3/·220	„	·260	23·704	13·358	3·47	316·20	·2972	·077	7·079			10	
„	„	„	„	„	·247	23·951	„	3·30	319·50	„	·073	7·152			11	
"Grebe"	2.12.99	„	„	„	·130	24·081	„	1·74	321·24	„	·038	7·190			12	
Original	1885	„	„	„	·920	25·001	„	12·28	333·52	„	·273	7·463			13	
„	„	Beach	„	„	·010	25·011	„	·13	333·65	„	·003	7·466			14	
Original U.G. ..	„	8558	21/·100	90/85 4 cores.	·221		13·35	2·95			·067					

DISTRIBUTION OF CABLE IN TANKS ON LEAVING THE THAMES, DECEMBER 12TH, 1903.

FORE TANK.

Core.		Piece.		Factory No.		Length. N.M.
Twin	...	4	...	8552	=	0·034
„	...	3	...	„	=	0·053
„	...	1	...	„	=	2·684
„	...	2	...	„	=	0·235
„	...	—	...	8553	=	1·1085

AFTER TANK.

Type		Piece.		Factory No.		Length. N.M.
—	...	—	...	8567	=	0·113
—	...	—	...	8556	=	1·654
Main	...	2	...	8512	=	0·150
„	...	pt. 5	...	„	=	0·616
„	...	pt. 4	...	„	=	0·986
„	...	pt. "C"	...	„	=	0·868
„	...	pt. 5	...	„	=	0·422
„	...	pt. 6	...	„	=	1·722
„	...	pt. "B"	...	„	=	0·081
„	...	pt. "B"	...	„	=	0·106
H.I.	...	—	...	8514	=	0·5511
„	...	—	...	„	=	0·3724
L.I.	...	—	...	8513	=	0·2200
H.I.	...	—	...	8514	=	0·5000

FACTORY ELECTRICAL VALUES AT 75° FAHR. OF CABLE ON BOARD S.S. "BUCCANEER,"

On Leaving the Thames, December 12th, 1903.

Fore Tank.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total.	Per N.M.	Total.	Per N.M.	Total.	Per N.M.	
										Top.
Twin Piece 4 8552	Plain 1	0·034	0·0344	0·4572	13·29	0·0103	·2993	—	—	
	Rib 2			0·4561	13·26	0·0101	·2950	—	—	
Twin Piece 3 8552	Plain 1	0·053	0·0536	0·7123	13·29	0·0160	·2993	—	—	"Buccaneer," 13.11.03.
	Rib 2			0·7107	13·26	0·0158	·2950	—	—	
Twin Piece 1 8552	Plain 1	2·684	2·715	36·080	13·29	0·8126	·2993	—	—	14.11.03.
	Rib 2			36·000	13·26	0·8009	·2950	—	—	
Twin Piece 2 8552	Plain 1	0·235	0·2377	3·159	13·29	0·0711	·2993	—	—	16.11.03.
	Rib 2			3·152	13·26	0·0701	·2950	—	—	
				Lengths, etc., as spliced up.						
Twin 8552	Plain 1	3·006	3·0407	40·408	13·29	0·9100	0·2993	—	—	
	Rib 2			40·3188	13·26	0·8969	0·2950	—	—	
Twin 8553	No. 1	1·1085	1·1210	14·720	13·13	0·3704	·3304	2132·	2390·	
	No. 2			14·730	13·14	0·3689	·3291	2618·	2935·	Bottom.

Factory Electrical Values at 75° F. of Cable on Board S.S. "Buccaneer" on leaving the Thames, December 12th, 1903.

After Tank.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total	Per N.M.	Total	Per N.M.	Total	Per N.M.	
8567	Rib	0·113		1·486	13·15	0·0351	0·311			Top in Tank.
	Plain			1·480	13·10	0·0376	0·333			"Buccaneer," 11.12.03.
8556	1	1·654		22·162	13·40	0·5805	0·351			
	2			22·032	13·32	0·5673	0·343			
	Total	1·767								
Main Piece 2 8512		0·150		2·553	17·02	0·0498	0·3320			"Buccaneer," 24.11.03.
Main Pt. 5 8512		0·616		10·480	„	0·2045	„			
Main Piece 4 8512		0·986		16·780	„	0·3273	„	588	580	"Buccaneer," 24.11.03.
	Total	1·752		29·813	17·02	0·5816	0·3320			
Main Piece C 8512		0·868		15·146	17·45	0·2651	0·3054			Factory, Dec. 03.
Main Pt. 3		0·422		7·364	„	0·1289	„			Factory, 18 & 19.11.03.
Main Piece 6		1·722		30·050	„	0·5 9	„			„ „ „
Main Pt. B		0·081		1·414	„	0·0247	„			„ „ „
Main Pt. B		0·106		1·850	„	0·0324	„			„ „ „
	Total	3·199		55·824	17·45	0·9770	0·3054			
				As spliced together.						
		3·199		55·824		0·9770				
		1·752		29·813		0·5816				
	Total	4·951		85·637	17·30	1·5586	0·3150			
H.I. 8514		0·5511		9·385	17·03	0·1962	0·356	693	382	"Buccaneer," 25.11.03.
H.I. 8514		0·3724		6·342	„	0·1325	„	1026	„	
L.I. 8513		0·2200		3·747	„	0·0783	„	1736	„	„ „ „
H.I. 8514		0·5000		8·515	„	0·1780	„	764	„	Tapering Splice Siemens.
	Total	1·6435		27·989	17·03	0·5850	0·356	232·4	382	

DISTRIBUTION OF CABLE IN TANKS ON RETURN TO THE THAMES, DECEMBER 28TH, 1903.

FORE TANK.

Core.	Piece.	Factory No.	Length. N.M.
—	*"A"	8567	0·1500
Twin	4	8552	0·034
,,	3	,,	0·053
,,	1	,,	2·684
,,	2	,,	0·235
,,	—	8553	1·1085

AFTER TANK.

Type.	Piece.	Factory No.	Length. N.M.
—	—	8556	1·5355
Main	2	8512	0·1500
,,	pt. 5	,,	0·616
,,	4	,,	0·986
,,	"C"	,,	0·868
,,	pt. 5	,,	0·422
,,	6	,,	1·722
,,	"B"	,,	0·081
,,	pt. "B"	,,	0·106
H.I.	—	8514	0·5511
,,	—	,,	0·3724
L.I.	—	8513	0·2200
H.I.	—	8514	0·5000

* Picked up during Repairs to Weston No. 1 Cable. Mechanically bad, electrically weak.

Factory Electrical Values at 75° F. of Cable on Board S.S. "Buccaneer" on Return to the Thames, 28.12.03.

FORE TANK.

Type.	No. of Wire.	Length in N.M.		C.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total	Per N.M.	Total	Per N.M.	Total	Per N.M.	
S.E. 8567	Core 90/85	0·150								Top. Mechanically and Electrically bad
Twin Piece 4 8552	Plain 1	0 034	0·0344	0·4572	13·29	0·0103	·2993			
	Rib 2			0·4561	13·26	0·0101	·2950			
Twin Piece 3 8552	Plain 1	0·053	0·0536	0·7123	13·29	0·0160	·2993			"Buccaneer," 13.11.03.
	Rib 2			0·7107	13·26	0·0158	·2950			
Twin Piece 1 8552	Plain 1	2·684	2·715	36·080	13·29	0·8126	·2993			14.11.03
	Rib 2			36·000	13·26	0·8009	·2950			
Twin Piece 2 8552	Plain 1	0·235	0·2377	3·159	13·29	0·0711	·2993			16.11.03.
	Rib 2			3·152	13·26	0·0701	·2950			
			Lengths, etc., as spliced up.							
Twin 8552	Plain 1 Rib 2	3·006	3·0407	40·408	13·29	0·9100	0·2993			
				40·3188	13 26	0·8969	0·2950			
Twin 8553	No. 1	1·1085	1·1210	14·720	13·13	0·3704	·3304	2132	2390	
	No. 2			14·730	13 14	0·3689	·3291	2618	2935	Bottom.

FACTORY ELECTRICAL VALUES AT 75° FAHR. OF CABLE ON BOARD S.S. "BUCCANEER,"

On Return to the Thames, December 28th, 1903.

AFTER TANK.

Type.	No. of Wire.	Length in N.M.		O.R. at 75° F.		Capacity.		D.R. at 75° F.		Remarks.
		Cable.	Core.	Total.	Per N.M.	Total.	Per N.M.	Total.	Per N.M.	
										Top in tank.
8556	1	1·5355		20·576	13·40	0·5390	·351	—	—	
	2			20·453	13·32	0·5267	·343	—	—	
Main Piece 2 8512		0·150		2·553	17·02	0·0498	·3320	—	—	"Buccaneer," 24.11.03.
Pt. Pc. 5 8512		0·616		10·480	„	0·2045	„	—	—	
Piece 4 8512		0·986		16·780	„	0·3273	„	588	580	„ „
	Tot.	1·752		29·813	17·02	0·5816	·3320	—	—	Factory, Dec. 03.
Pc. "C" 8512		0·868		15·146	17·45	0·2651	·3054	—	—	Silvertown Fact. 18—19.11.03.
Pt. Pc. 5 8512		0·422		7·364	„	0·1289	„	—	—	
Piece 6 8512		1·722		30·050	„	0·5259	„	—	—	„ „
Pt. Pc 'B' 8512		0·081		1·414	„	0·0247	„	—	—	„ „
Pc. "B" 8512		0·106		1·850	„	0·0324	„	—	—	„ „
	Total	3·199		55·824	17·45	0·9770	0·3054	—	—	
				As	spliced	together				
		3·199		55·824		0·9770		—	—	
		1·752		29·813		0·5816		—	—	
	otal	4·951		85·637	17·30	1·5586	·3150	—	—	
H.I. 8514		0·5511		9·385	17·03	0·1962	·356	693	382	"Buccaneer," 25.11.03.
H.I. 8514		0·3724		6·342	„	0·1325	„	1026	—	
L.I. 8513		0·2200		3·747	„	0·0783	„	1736	—	„ „
H.I. 8514		0·5000		8·515	„	0·1780	„	764	—	Tapering splice, (Siemens')
	Total	1·6435		27·979	17·03	0·5850	·356	232·4	382	

WESTON—WATERVILLE NO. 1 REPAIRS.

S.S. "BUCCANEER," DECEMBER 20TH AND 25TH, 1903.

EXPENDITURE TABLE.

TYPE 8567.

	N.M.
Received from Siemens' Bros. ex-barge "Wilts," December 9th, 1903	= 0·1150
Cut off December 11th, when splicing	= 0·0020
Laid in Weston—Waterville, No. 1	= 0·1080
Cut off for splice with Weston—Waterville end, Dec. 24th	= 0·0050
TOTAL	= 0·1150

TYPE 8556.

	N.M.
Received from Siemens' Bros. ex-barge "Wilts," December 9th, 1903	= 1·6600
Cut off for splice to 8567, December 11th, 1903	= 0·0060
Laid in Weston—Waterville, No. 1	= 0·1185
Remaining in After Tank, "Buccaneer"	= 1·5355
TOTAL	= 1·6600

Total expended Type 8567	= 0·1150
" " " 8556	= 0·1245
TOTAL	= 0·2395

DIAGRAM SHOWING OPERATIONS DURING WESTON—WATERVILLE No. 1 CABLE REPAIR BY S.S. "BUCCANEER," DECEMBER 20TH—25TH, 1903.

North or West. ←

Cable laid in=0·2265 N.M. {Plain=3·00 Ohms. Rib =3·00 „ Plain=0·077 Mfds. Rib =0·075 „

→ South or East.

Plain=22·58 Rib =22·51 Ω	Type and Sheathing=8567 20/·100 12x3/·220	8556 20/·100 12/·300
C.R. Ship =45·091 Shore=45·37 Ω	Core .. .. =90/85	90/85
Cable=1·567 N.M. L.L. =0·221 „		Plain. Rib.
Mean bot. temp.=48°·8 F. Splice „ „ =49° F.	C.R. per knot at 75°=13·10 13·15 Ω	13·4 13·32 Ω
Soundings=10 fms.	C.R. Abs. at 75° = 1·41 1·42	1·59 1·58
	Mfds. Mfds.	Mfds. Mfds.
	I.C. per knot .. =0·333 0·311	0·351 0·343
	I.C. Abs. .. =0·035 0·034	0·042 0·041
	Length .. .. =0·108 N.M.	0·1185 N.M.

TOTAL=0·2265 N.M.

Plain=4174·3 Rib =4179·1 Ω

C.R. Ship =8353·4 Shore=8378·0 Ω

Mean bot. temp. by I.C.R.=52°·2 F. Splice bot. temp.=48½° F.

Soundings=11½ fms.

TO WATERVILLE.

Length. Laid in.
Cable=1·567 + 0·2265 N.M.
L.L. =0·221 N.M.

	Plain.	Rib.
*Shore. D.R. 1′ Z.=	466· Ω	325· Ω

Splice 8567 and 8567.

*NOTE.—Tests from Ship to Shore for D.R. with 20 cells, S.R. 10000, Deflection 1′= nil, both on recovering end, after splicing on tank cable, and before making Final Splice.

Lengths.. .. =0·1500 + 0·004 cut off Weston end for splice=0·1540 N.M.

Type and Sheathing=8567

Core .. .. =90/85

	Plain.	Rib.
C.R. per knot at 75°=13·4	ω	13·358 ω
C.R. Abs. at 75° = 2·064		2·057
	Mfds.	Mfds.
I.C. per knot .. =0·3062		0·2972
I.C. Abs. .. =0·047		0·046

Cable cut out=0·1540 N.M. {Plain=2·064 Ohms. Rib =2·057 „ Plain=0·047 Mfds. Rib =0·046 „

TO WESTON.

Length=328·796 N.M.

D.R. 1′ Z.—*Ship*.

Plain=20·09=6606· Rib =18·834=6195· Ω per N.M.

Shore. Plain=22·04 Rib =26 34 Ω

I.C. from *Shore*. Plain=102·9 Rib =101·8 Mfds.

I.C. from *Ship*. Plain=100·77 Rib = 99·69

Splice 8567 and 8556.

	Plain. Length.	C.R. at 75°.	I.C.	Rib. Length.	C.R. at 75°.	I.C.
Cut out =	0·1540	2·064	0·047	0·1540	2·057	0·046
Laid in =	0·2265	3·000	0·077	0·2265	3·000	0·075
Diff. =	0·0725	0·936	0·030	0·0725	0·943	0·029
Previous=	330·513	4414·94	100·286	330·513	4419·67	98·941
Diff. =	·072	·93	·030	·072	·94	·029
Present =	330·585	4415·87	100·316	330·585	4420·61	98·970

Lohar R.C. Church 54°·45
Old Watch Tower
Western Pig Rock 35°·30

Lohar R.C. Church 61°·30
Old Watch Tower
Western Pig Rock 39°·30

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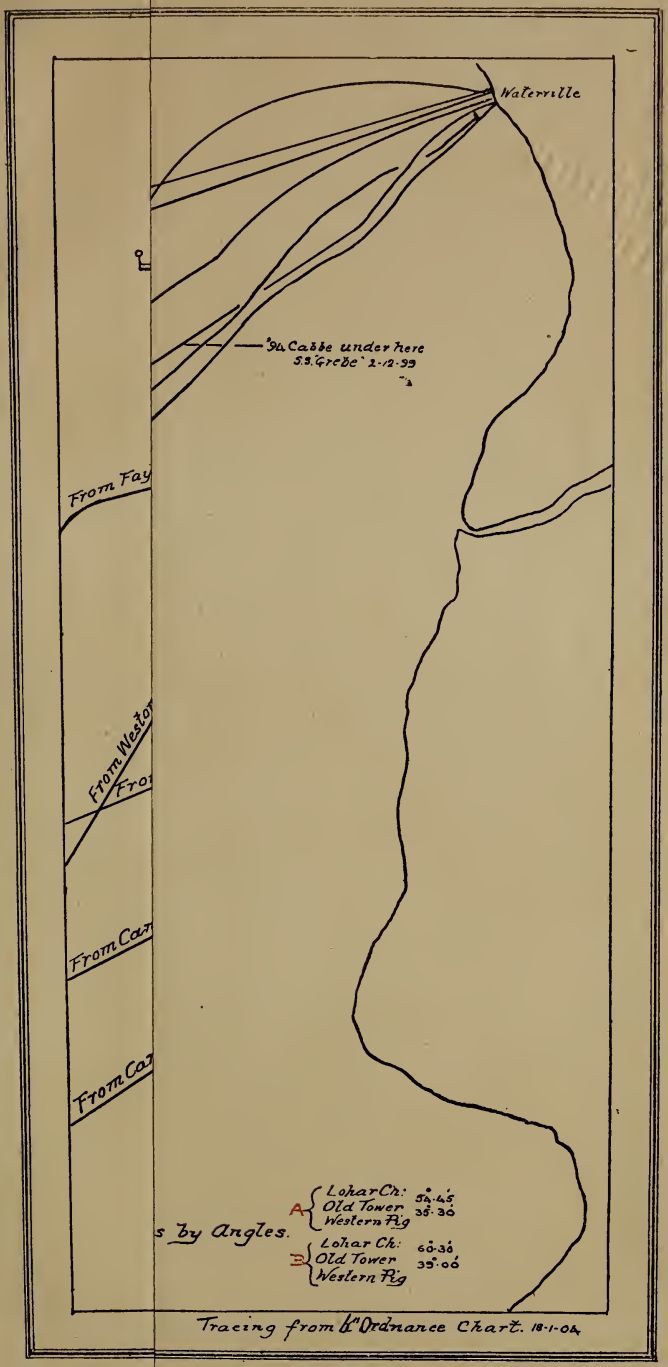

Tracing from Ld Ordnance Chart. 18-1-04

DIAGRAM SHOWING OPERATIONS DURING WESTON—WATERVILLE No. 1 CABLE REPAIR BY S.S. "BUCCANEER," DECEMBER 20TH—25TH, 1903.

North or West. ←——

Cable laid in=0·2265 N.M. {Plain=3·00 Ohms. Rib =3·00 „ Plain=0·077 Mfds. Rib =0·075 „

South or East. ——→

Plain=22·58 Ω
Rib =22·51 Ω
C.R. Ship =45·091 Ω
Shore=45·37 Ω
Cable=1·567 N.M.
L.L. =0·221 „
Mean bot. temp.=48°·8 F.
Splice „ „ =49° F.
Soundings=10 fms.

Type and Sheathing=8567 20/·100 12x3/·220
Core .. .. =90/85

	Plain.	Rib.
C.R. per knot at 75°=	13·10 Ω	13·15 Ω
C.R. Abs. at 75° =	1·41	1·42
	Mfds.	Mfds.
I.C. per knot .. =	0·333	0·311
I.C. Abs. .. =	0·035	0·034
Length .. .. =	0·108 N.M.	

8556 20/·100 12/·300
90/85

	Plain.	Rib.
	13·4 Ω	13·32 Ω
	1·59	1·58
	Mfds.	Mfds.
	0·351	0·343
	0·042	0·041
	0·1185 N.M.	

TOTAL=0·2265 N.M.

Plain=4174·3 Ω
Rib =4179·1 Ω
C.R. Ship =8353·4 Ω
Shore=8378·0 Ω
Mean bot. temp. by I.C.R.=52°·2 F.
Splice bot. temp.=48½° F.
Soundings=11½ fms.

TO WATERVILLE.

Length.	Laid in.
Cable=1·567	0·2265 N.M.
L.L. =0·221	N.M.

	Plain.	Rib.
*Shore. D.R. 1′ Z.=	466· Ω	325· Ω

Splice 8567 and 8567.

*NOTE.—Tests from Ship to Shore for D.R. with 20 cells, S.R. 10000, Deflection 1′= nil, both on recovering end, after splicing on tank cable, and before making Final Splice.

Lengths.. .. =0·1500 + 0·004 cut off Weston end for splice=0·1540 N.M.

Type and Sheathing=8567
Core .. .. =90/85

	Plain.	Rib.
C.R. per knot at 75°=	13·4 Ω	13·358 Ω
C.R. Abs. at 75° =	2·064	2·057
	Mfds.	Mfds.
I.C. per knot .. =	0·3062	0·2972
I.C. Abs. .. =	0·047	0·046

Cable cut out=0·1540 N.M. {Plain=2·064 Ohms. Rib =2·057 „ Plain=0·047 Mfds. Rib =0·046 „

TO WESTON.

Length=328·796 N.M.
D.R. 1′ Z.—*Ship.*
Plain=20·09=6606· Ω } per
Rib =18·834=6195· Ω } N.M.
Shore. Plain=22·04 Ω, Rib =26·34 Ω
I.C. from *Shore.* Plain=102·9 Mfds., Rib =101·8 Mfds.
I.C. from *Ship.* Plain=100·77 Mfds., Rib = 99·69 Mfds.
Splice 8567 and 8556.

PLAIN.	Length.	C.R. at 75°.	I.C.
Cut out =	0·1540	2·064	0·047
Laid in =	0·2265	3·000	0·077
Diff. =	0·0725	0·936	0·030
Previous=	330·513	4414·94	100·286
Diff. =	·072	·93	·030
Present =	330·585	4415·87	100·316

RIB.	Length.	C.R. at 75°.	I.C.
Cut out =	0·1540	2·057	0·046
Laid in =	0·2265	3·000	0·075
Diff. =	0·0725	0·943	0·029
Previous=	330·513	4419·67	98·941
Diff. =	·072	·94	·029
Present =	330·585	4420·61	98·970

Lohar R.C. Church } 54°·45
Old Watch Tower }
Western Pig Rock } 35°·30

Lohar R.C. Church } 61°·30
Old Watch Tower }
Western Pig Rock } 39°·30

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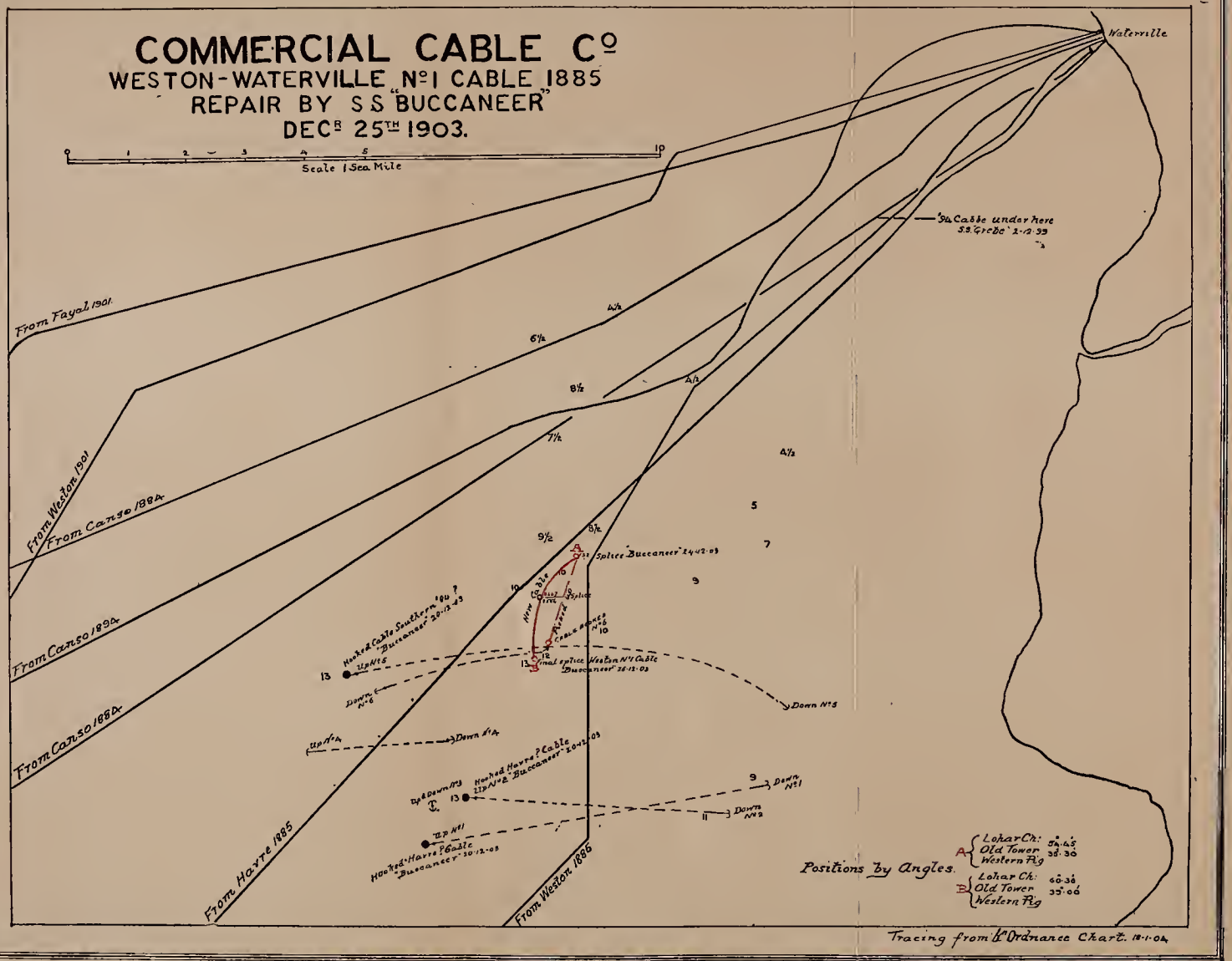
COMMERCIAL CABLE Co
WESTON-WATERVILLE No1 CABLE 1885
REPAIR BY S.S. "BUCCANEER"
DECR 25TH 1903.
Scale 1 Sea Mile
Waterville
'94 Cable under here
S.S. Grebe 2-12-99
From Fayal 1901
From Weston 1901
From Canso 1884
From Canso 1894
From Canso 1888
From Havre 1885
From Weston 1886
Splice Buccaneer 24-12-03
Hooked Cable Southern 190?
Buccaneer 20-12-03
Final splice Western No1 Cable
Buccaneer 28-12-03
Down No5
Up No4
Down No4
Hooked Havre P Cable
Buccaneer 30-12-03
Down No1
Down No2
Hooked Havre P Cable
Buccaneer 30-12-03
Positions by Angles.
A Lohar Ch: 54° 45'
Old Tower 38° 30'
Western Rg
B Lohar Ch: 60° 38'
Old Tower 35° 06'
Western Rg
Tracing from Lt Ordnance Chart. 18-1-04.

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